# Grevillea,

A QUARTERLY RECORD OF

## CRYPTOGAMIC BOTANY

AND ITS LITERATURE.

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EDITED BY GEORGE MASSEE.

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# Grevillea.

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## FUNGI AND MYCETOZOA.

### New Zealand Fungi, by M. C. Cooke.

**Rhizopogon violaceus,** *Cke. & Mass.*

Peridium deformed, spherico-depressed, smoky-brown, covered with a clear violet bloom, 2-4 c.m. diameter, coriaceous, inside becoming olive; gleba lacunose, tramal plates whitish; spores elliptical, hyaline or with a yellow tinge, smooth, 6-7 × 3-4 $\mu$.

In the ground, at length on the surface. N. Zealand. (*Kirk*, 382.)

There is no base, no indication of rooting fibrils, no dehiscence, and no capillitium; otherwise it has some suggestion of *Scleroderma.*

**Chromosporium pallescens,** *Cke. & Mass.*

Tufts at first more or less elliptical, then becoming confluent and forming irregular patches of a brownish-orange colour, eventually becoming pale; conidia numerous, globose, tinged with yellow, 4-5 $\mu$ diam.

Among mosses. Chatham Islands. (*Kirk*, 383.)

**Camarosporium Solandri,** *Cooke.*

Perithecia gregarious, often cæspitose, erumpent, black, subglobose; spores elliptical, obtuse, 3-septate, the two interstitial cells brown, one or both longitudinally divided, the terminal cells colourless, 20-25 × 8 $\mu$.

On twigs of *Fagus Solandri.* N. Zealand. (*Kirk*, 381.)

## NOTES ON EXOTIC FUNGI IN THE ROYAL HERBARIUM, KEW.

### By George Massee.

**Montagnites Elliotti,** *Mass.*

Pileus elliptical, then campanulate, at length expanded and almost flat, disc depressed, very smooth, whitish; margin of the volva attached to the apex of the stem irregularly torn; gills free, crowded, thin, dry, becoming black; spores elliptical, blackish-brown, 12 × 7 $\mu$; stem solid, rather woody, equally thickened upwards, sulcate above, fibrillose below, pallid, sheathed at the base by the large, lax volva.

Among sand. Nile Valley. (*Scott-Elliott.*)

Pileus 3-4 c.m. across when expanded, stem 10-15 c.m. long, 6-8 m.m. thick near the apex; the greater portion of the stem is buried in the sand, hence, in collecting the fungus, unless great care is taken, the volva is left behind.

Allied to *Montagnites Haussknechti*, Rab., but distinguished by the obtuse pileus, presence of an ample volva, and larger spores.

All the species belonging to the present genus grow in sandy, arid regions, and like *Battarrea* and other genera characteristic of similar localities, are at first enclosed in a stout volva, buried at a considerable depth in the sand, the hymenophore being elevated above the surface at maturity by the comparatively sudden increase in length of the stem. The Phalloideæ exhibit a similar mode of development.

The most pronounced morphological peculiarity presented by the members of the present genus is the entire absence of the flesh and cuticle of the pileus, the radiating gills being perfectly free from each other above. The volva is continuous with the apex of the stem, and, on the expansion of the gills, becomes split in an irregularly circumscissile manner near the apex, a small portion remaining attached to the apex of the stem, the greater portion remaining buried in the sand and sheathing the base of the stem.

*Montagnites* is evidently allied to *Coprinus* where the flesh of the pileus is in many species exceedingly thin, although never entirely absent; the last-named genus differs in the deliquescent gills. *Gyrophragmium*, belonging to the Gastromycetes, is also allied to *Montagnites*, differing in the anastomosing gills. *Secotium* and *Polyplocium* are also allies.

Pl. 182, Fig. 1, *Montagnites Elliotti*, nat. size; Fig. 2, young specimen of same showing the volva partially ruptured, nat. size; Fig. 3, section of same in the young stage, nat. size; Fig. 4, basidium with spores of same, × 400; Fig. 5, spores of same, × 400.

### THWAITESIELLA. *Mass.* (n.g.)

Resupinate, thin, rigid when dry; hymenium covered, except towards the margin, with thin raised plates that anastomose to form an irregular and interrupted honeycomb-like reticulation; the plates often radiate from a more or less central point, and are either continuous or broken up at intervals, and, along with the general surface, are densely covered with large, colourless, conical cystidia. Basidia tetrasporous; spores colourless, continuous.

*Radulum mirabile, B. & Br. Journ. Linn. Soc., Vol.* XIV., *p.* 61; *Sacc. Syll. Vol.* VI., *No.* 6940.

Hymenophore entirely resupinate, thin, resembling a *Corticium* or *Peniophora* in habit, but differing in having the surface traversed by thin vertical plates or ridges that anastomose to form an irregular network. The primary ridges often radiate from a central or excentric point; this arrangement is most obvious in

young specimens, which are usually more or less circular in outline. The ridges sometimes become more or less broken up into detached, short, tooth-like portions, still evidently arranged in lines and forming reticulations. This latter arrangement of the plates in all probability suggested to Berkeley and Broome the genus *Radulum*, from which the present genus is at once distinguished by having the entire surface of the hymenium, as well as the sides of the vertical plates, densely covered with stout, rigid, conical, colourless cystidia, that became incrusted with small, glistening crystals of oxalate of lime, exactly as in the genus *Peniophora*. The last-named genus differs in having the hymenium perfectly even. Basidia tetrasporous; spores colourless, continuous.

**Thwaitesiella mirabilis**, *Mass.*

Broadly effused, closely adnate and inseparable from the matrix, at first usually more or less orbicular, but the patches eventually grow into each other, thin, margin determinate; hymenium minutely velvety from the numerous projecting cystidia, plates very thin, 1-2 m.m. high, forming irregular pits from 2-4 m.m. in diameter; spores elliptical, ends obtuse, smooth, colourless, 9 × 5 $\mu$; cystidia numerous, fusiform, the portion projecting above the level of the hymenium conical, and measuring 50-60 × 12-6 $\mu$, colourless and rough at the apex, with minute particles of oxalate of lime. Whole fungus whitish when fresh, pale tan when dry.

*Radulum mirabile, B. & Br. Journ. Linn. Soc. Vol.* XIV., *p.* 61; *Sacc. Syll., Vol.* VI., *No.* 6940.

On decayed wood. Ceylon. (*Thwaites.*)

Patches 1-3 in. across, when confluent often extending for several inches.

Pl. 182, Fig. 8, fungus nat. size; Fig. 9, portion of hymenium showing a basidium and a cystidium, × 400.

**Geaster involutus**, *Mass.*

Exoperidium divided nearly to the base into 6-8 subequal, acute segments that become strongly incurved when dry, externally brown and scurfy, inside smooth and pale grey; endoperidium globose, slightly depressed, with an indistinct pedicel or sessile, pale yellowish tan; peristome conical, elongated, strongly grooved; capillitium threads usually simple, elongated, tips acute, almost colourless; spores globose, minutely warted, brown, about 4 $\mu$ diameter.

On the ground. St. Domingo, W. Indies.

Exoperidium about 2 c.m. across when expanded, the segments strongly incurved and rigid when dry. Allied to *Geaster striatulus*, Kalchbr., but distinguished by the pale inside of the exoperidium and the depressed endoperidium.

**Cyathus Baileyi**, *Mass.*

Peridium obconic or campanulate, at maturity widely open above, and with the margin slightly revolute, thin, and carti-

laginous, minutely tomentose externally, cinnamon-colour, glabrous and greyish-cinnamon inside, $\frac{2}{3}$-1 c.m. high; sporangiola 8-12 in number, biconvex, very smooth, grey, then black and shining, about 2-2·5 m.m. diameter; spores subglobose, colourless, 18-20 × 15-16 $\mu$.

On dung. Brisbane. (*Bailey.*)

More or less gregarious. Basidia bisporous, clavate, apex truncate, sterigmata elongated, slender.

**Diatrype (Nummularoidea) artocreas,** *C. & M.*

Stroma erumpent, suborbicular, distinctly marginate, thick, black outside and inside, 1-1$\frac{1}{2}$ c.m. broad; disc plane or slightly convex; margin elevated, sterile, minutely papillose, 4 m.m. thick; perithecia in one series, rather large, elongated, neck short, scarcely projecting, ostiolum rounded; asci cylindrical above, with an attenuated base, 8-spored, spores in one row, cymbiform, slightly curved, acute at both ends, hyaline, 2-guttulate, 10-12 × 3·5 $\mu$.

On rotten wood. St. Vincent, W. Indies.

In habit and external features a good *Nummularia*, but with the fruit of *Diatrype*. The spores are really narrowly lanceolate, but curved, and very acute at the tips, colourless. The present species forms the type of a new subgenus or section of Diatrype—*Nummularoidea*, having the stroma of *Nummularia*.

**Hamaspora longissima,** *Korn. Hedw., Vol.* XVI., *p.* 23 (1877).= Phragmidium longissimum, *Thüm. Flora, p.* 379 (1875); *Thüm. Myc. Univ. Exs., No.* 542; *Sacc. Syll., Vol.* VII., *Part* II., *No.* 2630.= Uredo lucida, *Thüm. Flora,* 1876, *p.* 570; *Thüm. Myc. Univ. Exs., No.* 1349; *Sacc. Syll., Vol.* VII., *Part* II., *No.* 2630; *Rab. Winter Fung. Eur. Exs., No.* 2925.

Specimens of the above-named fungus received at the Kew Herbarium in a fresh condition enabled the germination of the spores to be observed. The identification of these specimens was verified by comparison with a portion of Kalchbrenner's type specimen.

The teleutospores are agglutinated in long, slightly tapering filaments of a yellow colour, rather gelatinous when moist, but becoming silky-fibrillose and variously twisted when dry. The teleutospores are cylindrico-acuminate, 3-6 septate, 70-130 × 9-12 $\mu$, endochrome yellow; pedicel hyaline, tapering gradually towards the base, hollow, 200-300 × 9-10 $\mu$. Each cell of the teleutospore has a single germ-pore; the order of germination is always basipetal; the promycelial branches are elongated, rather closely transversely septate, and either simple or with short lateral branches of equal thickness to the parent hypha. Under favourable conditions each cell of the promycelial thread gives origin to a subglobose, very minutely warted, yellowish-white promycelium spore 9-10 $\mu$ in diameter, and borne on a slender sterigma. On germination the promycelium spores emit an elongated, transversely septate, sparingly branched germ-tube about

3 $\mu$ thick. From the above accounts it will be seen that the fungus under consideration is not a *Phragmidium*, as considered by Thumen, neither does it agree with Kornicke's genus *Hamaspora*; nevertheless, we are not disposed to establish a new genus for its reception, but rest content with indicating some of its peculiarities.

*Uredo lucida* was supposed by Thumen to be the uredo-stage of the above fungus only because it occurred on the same host-plant, *Rubus rigidus*.

Pl. 182, Fig. 11, *Hamaspora longissima*, group of filaments of agglutinated teleutospores, × 3; Fig. 12, teleutospores, one showing the commencement of germination, × 500; Fig. 13, teleutospore producing promycelium-spores, × 500; Fig. 14, promycelium-spore germinating, × 500; Fig. 15, spores of *Uredo lucida*, from Thumen's specimen, × 500.

**DENDROGRAPHIUM.** *Mass.* (n.g.).

Stem compound, simple or branched, formed of parallel, septate, coloured hyphæ that are agglutinated together below, the tips becoming free and lax at various levels (not capitate), and bearing the concatenate, coloured, septate conidia at their apices.

The present genus is in reality a compound *Helminthosporium*, or a *Podosporium* with catenulate conidia.

Distinguished from *Helminthosporium* as at present understood by the fasciculate arrangement of the erect hyphæ, which coalesce at the base in considerable numbers to form a compound stem; the conidia are also more persistently catenulate, although in both *Helminthosporium* and *Heterosporium* the conidia are often produced in chains that separate at an early stage of development.

**Dendrographium atrum**, *Mass.*

Gregarious, black, 1-1·5 m.m. high; hyphæ 5-6 $\mu$ thick, dark brown below, paler above, with numerous transverse septa; conidia cylindrico-clavate, 5-7 septate, not constricted at the septa, brown, pellucid, produced in short chains, 40-50 × 5-6 $\mu$.

On slender twigs. Amazon Valley.

Densely gregarious, surrounding the twigs and resembling a coarse velvet pile.

Pl. 182, Fig. 6, entire fungus, × 400.

**Guepinia elegans**, *Berk. & Curtis, Hook. Kew Misc.*, i., *p.* 239; *Sacc. Syll., Vol.* vi., *No.* 8517.

Spores elliptic-oblong, ends obtuse, slightly curved, 3-septate, colourless, 12-13 × 5-6 $\mu$.

**Guepinia pezizæformis**, *Berk. Hook. Lond. Journ.* 1845, *p.* 60; *Sacc. Syll., Vol.* vi., *No.* 8518.

Spores elliptic-oblong, tips rounded, slightly curved, 3-septate, colourless, 10 × 5 $\mu$.

**Guepinia dilatata**, *Berk. Hook. Journ.*, 1856, *p.* 274, *t.* x., *Fig.* 4; *Sacc. Syll., Vol.* vi., *No.* 8525.

Spores elliptic-oblong, ends rounded, continuous, colourless, 7 × 3-6 $\mu$.

**Guepinia cochleata,** *Berk. & Broome Fungi of Ceylon, No.* 655; *Journ. Linn. Soc., Vol.* XIV., *p.* 73; *Sacc. Syll., Vol.* VI., *No.* 8527.

Spores elliptic-oblong, ends rounded, obliquely apiculate at the base, continuous, colourless, $9 \times 4$ $\mu$; conidia globose, colourless, 3 $\mu$.

**Guepinia flabellata,** *Cooke Grev., Vol.* XIII., *p.* 3; *Sacc. Syll., Vol.* VI., *No.* 8528.

Spores elliptic-oblong, ends obtuse, obliquely apiculate at the base, continuous, colourless, $12 \times 4$ $\mu$; conidia colourless, globose, concatenate, 3 $\mu$.

**Guepinia fissa,** *Berk. Fung. Brit. Mus., Ann. Nat. Hist., Suppl. to Vol.* X., *Pl.* 12, *f.* 15 *b* (1843); *Sacc. Syll., Vol.* VI., *No.* 8538.

Spores elliptic-oblong, ends obtuse, continuous, straight or curved, colourless, $7 \times 3$ $\mu$.

**Guepinia ramosa,** *Currey, Indian Fungi, Trans. Linn. Soc., Ser.* 2, *Bot., Vol.* I., *p.* 127, *t.* 21, *Figs.* 2-3; *Sacc. Syll., Vol.* VI., *No.* 8533.

The present species is identical with *G. fissa*, Berk., as proved by examination of Currey's type specimen.

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## NEW OR CRITICAL BRITISH FUNGI.

By G. Massee.

**Uromyces (Micruromyces) Colchici,** *Mass.*

Spore-clusters numerous, large, elliptical, sometimes circinating, blackish-brown, occurring on both surfaces of the leaf; teleutospores broadly elliptical or subglobose, apex slightly prominent, and pierced by a single germ-pore, epispore about 2 $\mu$ thick, smooth, bright brown, 28-38 × 21-28 $\mu$; pedicel colourless, persistent, uniformly attenuated towards the base, 70-80 × 5-6 $\mu$.

On *Colchicum spectabilis*. Kew Gardens.

Appearing on the leaf-sheath and leaf. Most abundant on the lowest leaf, and always commencing at the base of the sheath, and gradually ascending to the apex. There are, in rare instances, a few scattered spore-clusters on the higher leaves, and these always appear at a later period than those on the lowest leaf, suggesting an upward extension of the mycelium. On the sheaths the spore-clusters are large and elliptical, 5-8 × 3-5 m.m., and often become seriate-confluent; on the leaves the clusters are as a rule smaller, and often circinate. Very abundant and attacking every plant of the species named, and although *Colchicum autumnale* grew on one side of the bed of infected plants, and *Colchicum Bavaricum* on the other, neither of the latter showed a trace of the parasite.

Pl. 182, Fig. 16, portion of leaf of *Colchicum spectabilis*, with the *Uromyces*, nat. size; Fig. 17, teleutospore of same, × 400; Fig. 18, apex of a teleutospore showing the germ-pore, × 1200.

**Peniophora Crosslandi,** *Mass.*

Effused, thin, soft when moist, hymenium minutely setulose, pale grey, with a slight ochraceous tinge when dry; margin determinate, slightly raised, the whole fungus separable from the matrix when dry; cystidia numerous, the portion projecting above the hymenium conical, 30-40 × 10 $\mu$, colourless and studded with particles of lime; spores elliptical, 6 × 3 $\mu$.

On bark and wood of fir.

Resembling *P. gigantea* in being soft and fleshy when growing, and cartilaginous and separable from the matrix when dry, but differing in the shorter cystidia and smaller spores. Patches 1-2 in. across. Halifax. (C. Crossland).

**Russula azurea,** *Bresad. Fungi Trident., t.* 24; *Cooke Hdbk. p.* 328; *Cooke Illustr. Pl.* 1088.

Pileus 3-7 c.m. across, convex, then expanded, and more or less depressed, dry, pale glaucous-green, or rather dark olive-green, disc often darker, and frequently with a tinge of purple, covered everywhere at first with a dense, whitish bloom, margin very slightly striate; cuticle separable; flesh about 3 m.m. thick, becoming thinner at the extreme margin, firm, white; gills very narrow behind, and very slightly adnexed, broader in front, 3-5 m.m. broad, crowded, brittle, often forked behind, with a few shorter ones that reach nearly to the base, connected by veins, pale cream colour from the first, not becoming darker; basidia clavate, sterigmata elongate, spores subglobose, minutely warted, colourless, about 9 × 8 $\mu$ diameter; cystidia absent; stem 4-5 c.m. long, 1-1·5 c.m. thick, nearly equal or slightly swollen at the base, very slightly longitudinally rugulose, solid but spongy inside, hence not firm when compressed. Taste quite mild; smell none.

On the ground under trees.

Judging from the specimens received from various correspondents for identification, the present species is almost invariably confounded with *Russula cyanoxantha*, Schæff., from which the present species is at once distinguished by the dense mealy layer, resembling bloom, on the pileus, the smooth spores, and absence of projecting cystidia in the hymenium. In *R. cyanoxantha* the hymenium is glabrous, rather viscid, spores minutely warted, and large pointed cystidia projecting much above the level of the basidia are numerous.

The characters furnished by the spores, whether rough or smooth, colourless or ochraceous, also the presence or absence of cystidia, projecting above the level of the hymenium, are characters of great importance in the discrimination of species of Russula—also others of the Agaricinæ, and should never be neglected.

**Dematium vinosum,** *Mass.*, n. sp.

Forming broadly extended patches of a chocolate colour. Sterile hyphæ creeping, colourless, septate, bearing here and there erect, branched, septate conidiophores; conidia concatenate, terminal on

the conidiophores, shortly cylindrical, ends truncate (barrel-shaped), vinous-brown, 10-12-8 $\mu$.

On damp, gummed paper. Commencing as pure white, waxy-looking patches; the conidia are fully formed and full sized before they become tinged with colour.

Pl. 182, fig. 7, portion of the fungus, × 400; Fig. 10, conidia.

## BIBLIOGRAPHY.

*Handbook of Australian Fungi* (M. C. Cooke).—The present volume—published under the authority of the several Governments of the Australian Colonies—contains a general introduction to the study of fungi, and descriptions of all species known to occur in Australia and Tasmania, numbering 2,084. As the greater part of the material forming the basis of this work has passed through Dr. Cooke's hands, the outcome is something more than a mere compilation, which must of necessity have been the case had the book been written by any other person; and in addition to being indispensable to every Australian mycologist, claims the attention of all systematists, inasmuch as it contains descriptions and figures of many new genera and species. There are 36 plates of figures and dissections, 20 of which are coloured.

*Sylloge Fungorum* (P. A. Saccardo, Supplementum Universale, Part 2).

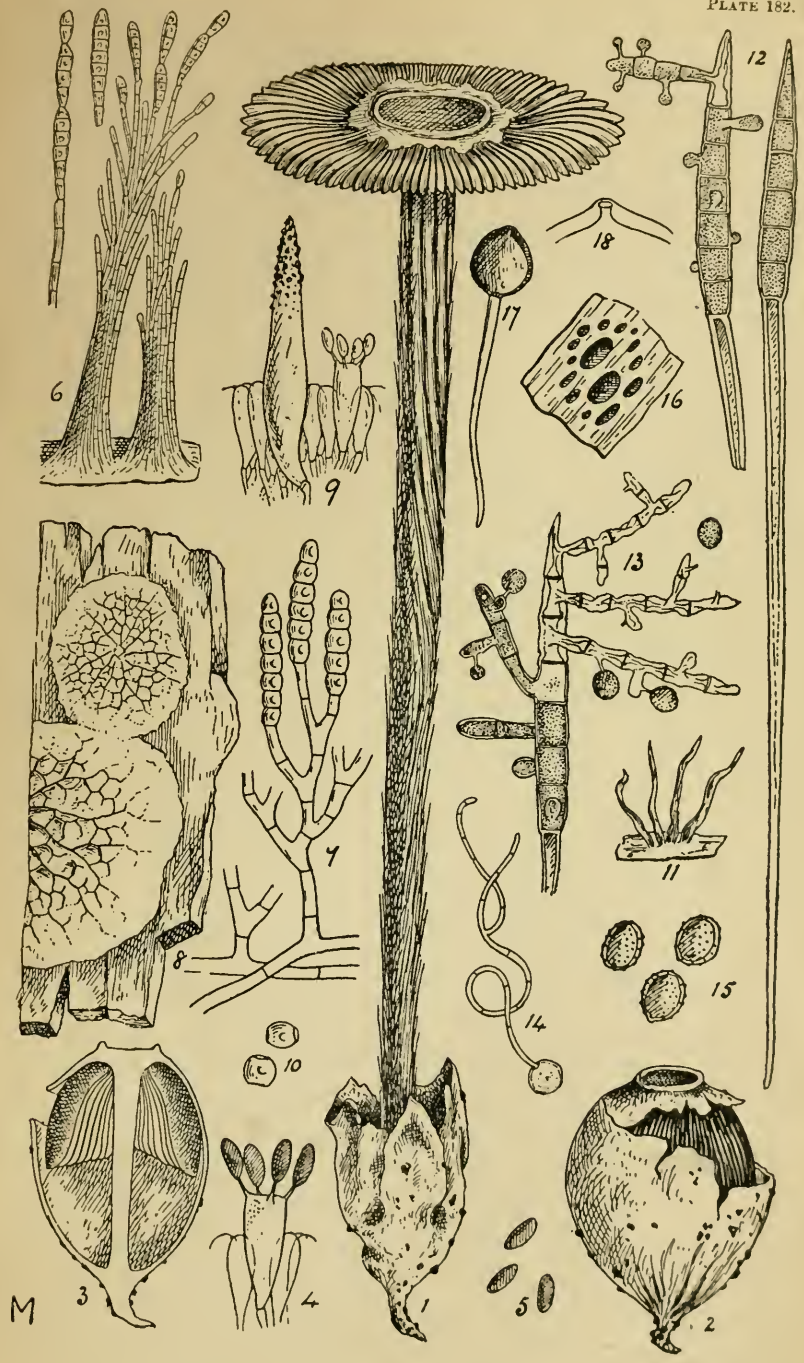
*North American Pyrenomycetes* (J. B. Ellis and B. M. Everhart, 1 Vol., with plates).—This work will be noticed in the next number of "Grevillea."

*Ascigerous Stage of Endoconidium temulentum*, Prill. and Delacr. —MM. Prillieux and Delacroix (Bull. Soc. Myc. de France, tom. viii., p. 22, 1892) describe the ascigerous condition of the above-named mould, which proves to be a species of *Phialea; Endoconidium temulentum*, a hyphomycetous fungus, characterized by the hyaline spores being produced in short chains within the branches and near their tips, was discovered by the above-named authors, parasitic on grains of rye, to which it imparted poisonous properties. The following is the description of the ascigerous form :—

**Phialea temulenta**, *Prill. & Delacr.*

Solitary or gregarious on a single grain. Cup plane or slightly undulato-convex, thin, at first partly closed, pallid, from ochraceous to honey-colour, 5-7 m.m. diameter; stem rather paler, equal, dilated upwards into the cup, 7-10 m.m. long, $\frac{1}{2}$-1 m.m. thick; asci cylindrical, 130 × 5 $\mu$, sporiferous part 65 $\mu$, at length operculate, not becoming blue with iodine; spores hyaline, obliquely uniseriate, ovate-fusoid, 10 × 4-5 $\mu$, paraphyses simple, continuous, the slightly incrassated tips tawny (1·5-2 $\mu$).

On fruits of *Secale cereale*, following *Endoconidium temulentum* Prill. & Delacr., of which it is the ascigerous stage.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*An Examination of the Species of the Genus Doassansia*, Cornu. —W. A. Setchell (Annals of Bot., Vol. vi., pp. 1-48) gives a detailed account of the morphology and systematic affinities of the species of *Doassansia*. The structure and spore germination are beautifully illustrated on two double plates. Five new North American species are described. The author is mistaken in supposing that *Sphæria (Depazea) alismatis*, Currey, is synonymous with *Doassansia alismatis* (Nees.), Cornu. Currey's species is a *Phyllosticta*, P. Curreyi, Sacc. Syll., Vol. iv., No. 331.

*Gymnosporium confusum.*—Ed. Fischer (Soc. Helvet. des Sci. Nat., t. xxvi., p. 490, 1891) in a preliminary note corroborates Plowright's statement as to the validity of *Gymnosporangium confusum*, Plow., being a distinct species.

*Septobasidium, a New Genus of Hymenomycetes.*—M. N. Patouillard (Journ. de Bot., Morot., 1892, p. 61) gives an account of the morphology of *Thelephora pedicellata*, Schw., the species on which the new genus is founded. The basidia are borne near the tips of the ultimate branchlets of the resupinate subiculum, and consists of a basal globose cell, from which springs a stout, curved, transversely septate filament or sterigmatophore, bearing the sterigmata on the convex side. The genus is most nearly allied to *Helicobasidium*, Pat., but distinguished by the large globose, aseptate, basal cell bearing the sterigmatophore.

*On the Effects of the Parasitism of Ustilago antherarum* (Fries).—Vuillemin (Comp. Rend., 1891, p. 662) points out that *Ustilago antherarum*, Fr. (*U. Violacea*, Pers., Fckl.)—a parasite common in the anthers and ovaries of species of *Silene*, *Lychnis*, *Saponaria*, and allied plants, causing what Giard (Comp. Rend., 1888, p. 757) calls "parasitic castration of the anthers"—illustrates a very remarkable relation between parasite and host. In pistillate flowers of *Lychnis*, the rudimentary anthers are stimulated to develop by the presence of the parasite, but the tapetal and archesporial layers are replaced by the mycelium and spores of the parasite. The development of the anthers in normally pistillate Lychnis flowers extends to the formation of those layers of the anther walls by which dehiscence is effected, hence the Ustilago spores are dispersed by the host-plant, as if they had been pollen-grains. Furthermore, the accessories of the normal staminate Lychnis flowers are developed in the pistillate form under these peculiar conditions, and such blooms are visited by those insects which convey the pollen of the staminate flower to the stigmas of the pistillate flower; under the circumstances described above the spores of the fungus are removed by the insect and deposited on the stigmas of other flowers, which in turn become affected by the parasite.

*The Genus Meliola* (A. Gaillard).—This carefully-elaborated monograph contains chapters on the morphology and anatomy of

the genus under consideration. Altogether 111 species are fully described, 32 being new to science. The author considers the short lateral branches, or hyphopodia, present on the creeping hyphæ to be undeveloped perithecia. The genus is divided into two primary sections, depending on the form of the asci, (1) asci ovoid or globose; (2) asci clavate or cylindrical. Each section is divided into groups depending on the number of septa present in the spore; a character found to be absolutely constant in each species. The work is illustrated by 24 plates, the figures being unnecessarily large; there is no advantage in drawing a spore nearly 2in. long and $\frac{3}{4}$in. broad, when one quarter that size would answer the purpose equally well.

*British Fungus-Flora* (Geo. Massee).—It is expected that the first volume of the above work will be ready in August. It contains a short introduction to the study of fungi, also descriptions, accompanied by critical notes from various authors, of all British species included in the following groups:—Gastromycetes, Tremellineæ, Clavariæ, Thelephoreæ, Hydneæ, Polyporeæ, and the black and purple spored species of Agaricinæ. The genera are illustrated. The following numbers justify the appearance of a new book on the subject. It is now 21 years since the last complete British Mycological Flora was published—Cooke's "Handbook of British Fungi"—the number of species therein described being 2,810, whereas the species now number 4,895, and are distributed as follows:—Basidiomycetes, 1,980; Ascomycetes, 1,275; Sphæropsideæ, 685; Hyphomycetes, 580; Uredineæ and Ustilagineæ, 230; Phycomycetes, 145.

*A Vanilla Disease* (George Massee, Kew Bulletin, Nos. 65, 66, p. 111; 1 pl.).—It is shown that the destruction of *Vanilla planifolia*, the Vanilla plant, in certain districts of the Seychelles and Reunion Islands, is due to a minute parasitic fungus, *Calospora vanillæ*, Mass. The life-history of the fungus has been completely followed, and its presence as the cause of the disease demonstrated.

*The Myxomycetes of Eastern Iowa.*—Thomas H. McBride (Bull. Lab. Nat. Hist. State Univers. Iowa, Vol. ii, p. 99) gives a detailed account, accompanied by a biological chapter, of the Myxomycetes of Iowa. Schroeter's arrangement, as given in Engler's "Pflanzen Familien," is followed, and 69 species are described. Under *Hemiarcyria stipata*, Sz., the author says, "Not to be confounded with Mr. Massee's *H. stipitata*, which is similar in the specific name only." Schweinitz's name presumably referred to the compactly packed sporangia, whereas *stipitata* had reference to the distinct stem. The monograph is illustrated by 10 excellent plates.

## FUNGUS FORAYS.

The annual foray of the "Yorkshire Naturalists' Union" will be held on Sept. 14th and 15th. The head-quarters will be at Malton; the first day will be devoted to an investigation of the woods on the Howardian tract, and on the second day the woods in the neighbourhood of Coxwold will be worked. The specimens will be named and arranged for exhibition in the Assembly Rooms at Malton. Dr. Cooke and other mycologists will be present, and the secretaries extend a cordial invitation to mycologists from all parts of the country, who will be "put up" at Malton. Intending visitors are requested to communicate at an early date with W. Denison Roebuck, F.L.S., Sunny Bank, Leeds.

The dates for the forays of the "Essex Field Club," Herts, &c., are not yet fixed.

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## MUSCINEÆ.

### Bibliography.

*The British Moss Flora. R. Braithwaite, M.D.*, 303, Clapham Road, London. *Fam. XV., Bryaceæ, II.*

In the number just issued the author describes the mosses of the old genera, *Webera*, *Zieria*, and *Bryum*, including twenty-five species of the last-named genus only. The name *Webera* is replaced by the older name *Pohlia*, and *Zieria* by *Plagiobryum*.

The genus *Pohlia* is divided into two sections:—I. *Eupohlia*, containing the species with a long-necked capsule and rudimentary cilia. II. *Lamprophyllum*, with glossy leaves, a short-necked capsule, and well developed cilia. *Bryum Schimperi*, Wils. (or *Bryum catenulatum*, Schimp. Syn.), is raised to specific rank under the name of *Pohlia commutata* Lindb., and *Webera Ludwigii β gracilis* is also raised to specific rank under its varietal name. *Webera Tozeri* of Schimp. Syn. becomes *Epipterygium Tozeri*, Lind.

The genus *Bryum* is divided into three sections:—I. *Sclerodictyon*, including the species with adpressed leaves and the upper cells linear. II. *Cladodium*, leaves erecto-patent, endostome adherent to peristome, and cilia abortive. In this *B. cernuum*, Br. and Sch., becomes *B. pendulum*, Schimp., and *B. uliginosum* is changed to *B. cernuum*, Lind. Changes of name are always to be regretted, but especially when, as in this case, it only adds to previous confusion. *B. pendulum* having, according to the author's synonymy, been used as an earlier name for *B. filiforme*, Dicks., and *B. bicolor*, Dicks., whilst *B. cernuum*, Br. and Sch., has long been the recognized name for *B. pendulum*, Schimp.

The new species in this section are *B. purpurascens*, Br. and Sch., and *B. fallax*, Milde, both belonging to the *lacustre* group, but differing in the margined leaves. *B. purpurascens* has a pale capsule on a short seta, and is synoicous, and *B. fallax* a brown capsule and long seta, and is dioicous.

III. *Eubryum*, leaves erecto-patent, free endostome, with 2-4 appendiculate cilia.

In this section *Bryum bimum*, *β. cuspidatum*, Br. Sch., becomes *B. affine*, Lind., and *B. cirrhatum*, Hornsch., is reduced to a variety of *B. affine*. *B. Barnesii*, Schimp., is regarded as a form of *B. argenteum*, L., starved by growth in sand. *B. atropurpureum* is changed to *B. bicolor*, Dicks., and *B. apiculatum*, Wils., to *B. Mildei*, Juratz.

One new species occurs in this section, *B. rubens*, Mitten, which differs from *B. erythrocarpum* in its margined leaves with wider cells. From the species with margined leaves it differs in the leaves not being twisted when dry, and in the dioicous inflorescence.

The illustrations in this very difficult genus are given with great fidelity, except, perhaps, in the case of the mature capsule of *B. crudum* and the unripe capsules of *B. bicolor* and *B. murale*. In the latter two the characteristic form is very distinctive, being markedly pyriform in *B. murale* and ovate with the broad end nearest the seta in *B. bicolor*.

It would considerably increase the value of this indispensable work if the author would ascertain from collectors of specimens the characteristic features of the growing plants, and record them. Thus in *Bryum calophyllum* the beautiful red tint of the stems distinguish it at sight from *B. Warneum*, which fruits at the same date, and *B. Marratii* may be looked for in vain in August, when the two last-named species are in mature fruit, *B. Marratii* not being mature until about November, although all three species grow in damp flat hollows among sand-dunes.

The microscopical and bibliographical work is so full and so thoroughly well done that a feeling of regret is experienced on finding so little of the natural history of the plants themselves, especially in a group of mosses in which information of that kind would prove of exceeding value.

E. M. H.

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*Musci Zunnanenses.* *E. Bescherelle* (*Ann. Sci. Nat Bot.*, tom. xv., No. 1, p. 47, 1892) gives an account of a collection of mosses made by the French Missionary, M. l'Abbé David, in China, between 26° and 27° N. lat., the principal localities being Tapintze, Hokin, and Lake Tali. Many common European species occur, or are replaced by very closely-allied species, whereas, on the other hand, many genera and species that are widely distributed in Europe are entirely absent (as *Gymnostomum*, *Weisia*, *Dicranella*, *Camphylopus*, *Atrichum*, *Polytrichum*, etc.), others being represented by one

or two species only (*Bryum*, *Trichostomum*, *Rhacomitrium*, *Minum*, *Leskea*, etc.). *Bartramidula Wilsoni*, a species only collected in Ireland hitherto, occurred in small quantity at Yun-Nan. Several new species are described.

The last-named species of moss is not, as stated by M. Bescherelle, confined to Ireland. It was first collected there by Wilson, but, as specimens in the Kew Herbarium show, has since been found in N. Wales, Scotland (Clova), and also at Fernando Po, where it was collected by Mann.

*Orthotrichum obtusifolium*, Schrad.—This rare moss was collected by Mr. Barnes near Abbey Bridge, Yorkshire, during a recent excursion of the Yorkshire Naturalists' Union.

The July number of the "Irish Naturalist" contains an article on the Hepaticæ of King's and Queen's Counties by David M'Ardle; also the discovery of *Hypnum filicinum*, var. *rallisclausæ*, Brid., a new record for Ireland, by the Rev. H. W. Lett.

F. Stephani, *Colenso's New Zealand Hepaticæ* (Linn. Journ., No. 201). *Hepaticæ Africanæ* (continued), 3 pl. (Hedwigia, 1892, p. 120).

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## NEW OR CRITICAL BRITISH ALGÆ.

By E. A. Batters, LL.B., F.L.S.

### Ascophyllum Mackaii. Holm. et Batt. f. Robertsoni, Batt.

Amongst the specimens of Algæ sent to me for identification in the autumn of the year 1891 by Mr. David Robertson, of Cumbrae, was one from Loch Ranza, Arran, which at first sight I took to be a barren specimen of *Pelvetia canaliculata*. In the letter which accompanied the specimen, however, Mr. Robertson explained that he found the plant in a quiet sheltered bay, growing in large, roundish, unattached masses lying on the muddy sand at a level below that at which *Pelvetia* is usually found. I consequently came to the conclusion that the plant was a form of *Ascophyllum Mackaii*, and in the hope of obtaining fruited specimens, and thus settling the identification of the plant, I asked Mr. Robertson to send me fresh specimens at various seasons. This he has most obligingly done, and in May of the present year sent me a quantity of fruited specimens, which prove beyond a doubt that the plant is an *Ascophyllum* closely related to *A. Mackaii*, but differing from the typical form of that species in many and not unimportant particulars.

Of *Ascophyllum Mackaii* itself, although discovered as long ago as 1805, little is known, and more than a doubt has been expressed as to its right to specific rank. Prof. J. G. Agardh, in his "Species Genera et Ordines Algarum," Vol. i., p. 206, adopts his

father's view that it is a variety of *A. nodosum*, the peculiar characteristics of which are due to its place of growth. More recently Dr. J. Reinke has ("Algenfl.," p. 34) expressed an almost similar opinion, suggesting that *A. Mackaii* is perhaps nothing more than the adventitious lateral branches of *A. nodosum*, which having become detached, continue to grow while in a free floating condition. The descriptions and figures of the species as given in Turner's "Fuci," t. 52, Sowerby's "English Botany," t. 1927, and Harvey's "Phycologia," t. 52, certainly favour this supposition, which is furthermore confirmed by authentic specimens of this species gathered by McCalla, Harvey, and Dr. Scouler, now in my Herbarium.

It seems probable, therefore, that *A. Mackaii* may turn out to be nothing more than *A. nodosum* modified by its environment With regard to the plant found by Mr. Robertson, however, the position of the receptacles, which are usually borne on the extremities of the ordinary branches (see Plate 183, Figs. 1 and 2), and not on special lateral deciduous branches, as in *A. nodosum*, seems to me to preclude the idea of uniting it with that species. If, therefore, *A. Mackaii* on further investigation prove to be but a form of *A. nodosum*, I would raise the Arran plant, which I have named *A. Mackaii f. Robertsoni* ("Journal of Bot.," June, 1892) to specific rank under the name *A. Robertsoni*.

In authentic specimens of *A. Mackaii*, from Roundstone Bay, the fronds are slender, nearly cylindrical, provided with air-vessels, and very irregularly branched, the receptacles stalked, pedulous, borne near the base of the frond.

In the Arran plants, however, the fronds are compressed, destitute of air-vessels, more robust than the Irish specimens, irregularly branched below, and regularly dichotomously above, the receptacles are nearly all terminal, although not unfrequently a few are borne on short lateral branches, as in *A. nodosum* and *A. Mackaii*.

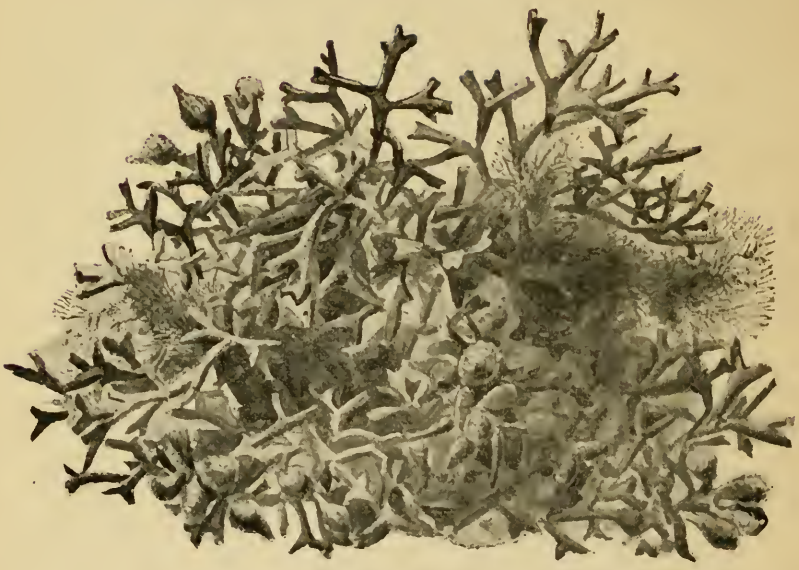
So close a resemblance does the plant bear to *Pelvetia canaliculata* that it has more than once been suggested to me that perhaps it is a hybrid between that plant and *A. nodosum*, but beyond the inherent improbability of this theory the fact remains that *Pelvetia* and *Ascophyllum* produce their receptacles at different seasons of the year, and as *Pelvetia* is a monœcious genus, it is very improbable that it would cross with individuals of another genus. The plants, moreover, grow side by side almost everywhere around our coasts, and no trace of anything resembling a hybrid has up to the present been observed. It seems more reasonable to suppose that the species is of recent origin, and having sprung from *A. nodosum* still shows traces of its ancestry in the occasional lateral receptacles.

The following is the diagnosis I propose for the new variety :—

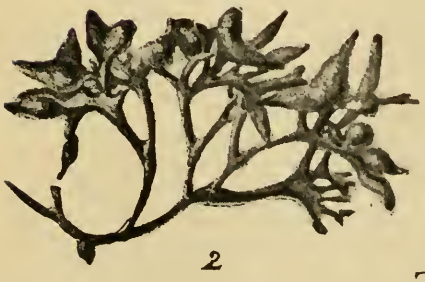
Fronds gregarious, growing in dense, nearly globular, unattached masses, compressed, slender, 4-6 inches long, $\frac{1}{16}$-$\frac{1}{8}$ inch

4

5



1



2

3

B

diam.; repeatedly dichotomous, occasionally subpinnate below, tips scarcely attenuated; air-vessels wanting; receptacle dioecious, lanceolate, ovate, or globose, often 2-3 lobed, terminal on the ordinary branches or on short lateral shoots. Male receptacles much more numerous than female.

Lying unattached on the muddy sand of a quiet land-locked bay. Loch Ranza, Arran, at half-tide level. David Robertson.

### Explanation of Plate 183.

Fig. 1. Plant slightly reduced, showing its habit.
,, 2. Portion of frond with terminal receptacles, natural size.
,, 3. Portion of frond with lateral receptacles.
,, 4. Oospore, × 200.
,, 5. Group of Antheridia, × 200.

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Several papers dealing with the algal-flora of the British Islands have recently been published. In the "Journal of Botany" (March and June, 1892), I have described two new species, besides giving a list of the additions to the algal-flora of the Clyde sea-area, while in the "Annals of Botany" (July) and the "Phycological Memoirs," Part I., I have described two more new species. Johnson in the "Irish Naturalist," Part I., mentions a new species, and several never before reported from the shores of the British Islands; Harvey-Gibson, besides some interesting "Observations on the British Marine Algæ" ("Journal of Botany," April, 1892), gives in the transactions of the Natural History Society of Glasgow a useful list of the marine algæ of the Oban district; finally in his paper on the "Parasitical Phæosporeæ" ("Journal de Botanique," 1892) Sauvageau mentions that one of the species he there describes for the first time had been found on our shores, as well as those of France; while Kjellman states that one of the new species described by him in his "Handbok i Skandinaviens Hafsalgflora" is met with in England.

In the accompanying list I have gathered together the records scattered through these various publications, and in the hope of obtaining further information as to the distribution of the species on our coasts, I have added notes which I trust will enable those local collectors who do not possess the original descriptions to recognize the species mentioned.

**Microchæte æruginea,** *Batt. Journ. Bot.* xxx., *p.* 86.

Like the other species of *Microchæte*, this little plant, which is scarcely visible to the naked eye, bears a very close resemblance to some of the marine species of *Calothrix*, but its filaments never end in a hyaline hair as theirs do. From *M. tenera*, its nearest ally, it may at all times be known by the greater thickness of its filaments, 12 $\mu$ (trichoma, 6-7 $\mu$), while those of *M. tenera* are 6-7 $\mu$ (trichoma, 5 $\mu$), and shortness of its articulations (about twice as broad as long) as well as by its marine habitat. It grows

in stellate tufts on the fronds of *Rhodochorton Rothii* and *R. floridulum* in shallow sandy pools near high-water mark. Berwick.

**Brachytrichia Balani,** *Born. et Flah. Ann. Sc. Nat.*, 7 ser., Vol. IV., p. 372.

This interesting species was discovered in February of the present year by Mr. G. Massee, at Bournemouth, on posts at half-tide level. The fronds, which somewhat resemble those of a *Rivularia*, are minute, seldom more than $\frac{1}{8}$-$\frac{1}{4}$ inch in diameter, gelatinous, at first globose and solid, then hollow and plicate; in colour they vary from blackish to a dirty brownish-white, the filaments of which the frond is composed are simple towards the surface of the frond, but branched in a bifurcate manner below; the heterocysts are intercalary, discoidal, and scattered without order through the filaments.

**Halosphæra viridis,** *Schmitz. Mitth. Zoolog. Stat., zu Neapel.* Band 1, heft 1, p. 67-92, t. III.

In Part I. of the "Irish Naturalist," Prof. Johnson mentions that this curious alga was constantly present in tow net catches round the whole west coast of Ireland, even well out in the Atlantic, in one instance 27 miles west of Achill Island. Prof. Johnson further mentions that the alga has been found by Mr. J. D. Cunningham in Plymouth Sound. The plant in question is a very minute, green, globular mass, hardly as large as a pin's head. The contents of this globular cell, by repeated bipartition of the cell nucleus, are transformed into very numerous daughter-cells, from which arise the zoospores. Prof. Schmitz remarks, in his account of the plant, that the formation of the zoospores differs essentially from that of the other green algæ, in the fact that the zoospores do not arise directly through transformation of the daughter-cells of the original mother-cells, but are formed by a further division of these daughter-cells.

**Chlorochytrium dermatocolax,** *Reinke Algenfl. p.* 88.

This curious algæ forms longish, somewhat flattened, unicellular saes, 20-30 $\mu$ long by 15-20 $\mu$ broad, in the cell-wall of *Polyides rotundus*, *Polysiphonia elongata*, etc. Cumbræ.

**Ulvella lens,** *Crouan Flor du Finist. p.* 130, *t.* 9. (*Phyllactidium Lens*).

The species of the genus Ulvella are characterized by forming disc-like expansions which are composed of two or more layers of cells in the central portion, while the marginal part is monostromatic. *U. Lens* forms roundish dark green expansions hardly larger than a pin's head, which adhere by their entire under-surface to the substance on which they grow. These expansions frequently become confluent, and then the plant is more apparent to the naked eye. The cells composing the central portion of the frond are roundish and arranged without apparent order; those of the margin are more or less angular, and arranged in regular rows. I have found the plant in considerable abundance on rocks, fuci, etc., at Cumbræ, Ayrshire, Heswall and North Kirby, Cheshire, and Point of Ayr, Flintshire.

**Protoderma marinum**, *Rke. Algenfl. p.* 81.

This species forms irregular closely adnate expansions, composed of a single layer of cells, on rocks near high-water mark. The cells composing the frond are roundish or slightly angular, and are arranged without apparent order. The plant is not uncommon at Cumbræ.

**Monostroma fuscum**, *Wittr. Monost. p* 53, *t.* 4, *fig.* 13.

Fintry bay, Cumbræ, on *Chorda filum*, etc., in sandy places, at low-water mark or beyond. E. B., Scarborough, G. Massee.

Thallus somewhat rigid, a clear dark green when living, the colour changing in the Herbarium to a dirty brown. Cells angular, arranged without order, usually filled with starch grains, in section square or nearly so, 20-30 $\mu$ in thickness.

**Acrochæte repens**, *Pringsh. Morph. Meeres. Alg.*

This plant closely resembles *Bolbocoleon*, from which it is distinguished by the bristles arising directly from the ends of the upright vegetative cells, and not from a bulbous base. Epiphytic on *Leathesia*, Cumbræ.

**Chætomorpha linum**, *Kuetz. f. puvinata*, *Batt. Journal of Botany*, 1892.

Fintry Bay, Cumbræ. Not uncommon.

This curious variety, which (*l.c.*) I have referred to *Ch. linum*, Kuetz., differs so much in habit from the typical form of the species that I still entertain some doubts as to the correctness of the identification. The filaments are usually from 150 to 200 $\mu$ thick, so that as regards size the plant might be either a slender form of *Ch. ærea*, Kuetz., or of *Ch. linum*, Kuetz. The former plant is usually found attached to the sides of rock pools near high-water mark, while the latter is always found unattached in extensive fleecy webs. The variety forms compact, cushion-like patches, several inches in diameter, over *Corallina* and other algæ, in shallow sandy pools between tide marks, and, so far as I have observed, is never attached to the rock. Hauck and several other authors have expressed the opinion that *Ch. ærea*, *Ch. linum*, and *Ch. crassa* are but forms of one and the same species, and certainly this curious variety seems to be an intermediate form between the two former species.

**Ostreobium Queketti**, *Born. et Flah. Bullet. Soc. Bot. France, Vol.* XXXVI.

Cumbræ, Gare Loch. Not uncommon.

One of the interesting class of perforating algæ. The present species is very like Gomontia, from which it may at once be distinguished by the fronds being unicellular. It appears to be not uncommon in shells, but as yet no undoubted reproductive organs have been found.

**Desmotrichum balticum**, *Kuetz. Sp. Alg. p.* 470, *Reinke Atlas t.* 12.

On *Zostera*. Weymouth.

This plant grows on zostera leaves in tufts, scarcely visible to the naked eye, and as it is, with us, usually accompanied by

*Halothrix lumbricalis*, Rke., *Desmotrichum undulatum*, Rke., *Punctaria latifolia*, Grev., *Ect. fasciculatus*, Harv., etc., which conceal its tiny fronds from view, its discovery is rendered still more difficult. My specimens are only from 1·5-2 m.m. in length, although Baltic specimens are said to reach 10 m.m. The fronds are simple, for the most part composed of a single row of cells, with here and there a longitudinal septum, and an occasional hyaline hair. More rarely the frond is composed throughout of from 2-3 rows of cells. The plurilocular sporangia appear either as conical protuberances with broad bases, sessile on the vegetative cells, or are formed in the continuity of the frond by transformation of the cells, frequently 5 or 6 contiguous cells being transformed into sporangia. Unilocular sporangia unknown.

**Desmotrichum undulatum**, *Rke. Algenfl. p.* 55. *Atlas t.* 11.
Weymouth.

In our revised list of British Marine Algæ,* Mr. Holmes and I have admitted this species on the authority of a specimen in the Greville Herbarium labelled *Punctaria tenuissima*, Grev., in Greville's own writing. The specimen is a mixture of *Punctaria latifolia*, var. *Zosteræ*, Lyngb. (in fruit), and *Scytosiphon lomentarius*, Ag., with a few fronds of what appears to be the present species, but owing to the age of the specimen it is difficult to examine it accurately, and consequently to form a correct opinion as to the species. I am glad, therefore, to be able to report the discovery of undoubted specimens of *D. undulatum*, Rke. My specimens are very small, being only 5 to 6 m.m. long, while Baltic specimens sometimes attain to 12 centimetres in length, but are well fruited, leaving no possible doubt as to the genus and species to which they belong. *D. undulatum* may always be known from *D. balticum* by the fact that there are many cells, usually from 6-40, but always more than 2, in the width of a frond. A section also shows the frond to be composed of from 2-4 layers. The frond is also much more thickly covered with scattered hyaline hairs than is the case with *D. Balticum*.

**Pogotrichum filiforme**, *Rke. Atlas, t.* 41, *figs.* 12-25.—Forma **gracilis**, nov. form.

In his "Atlas Deutscher. Meeresalgen" Dr. Reinke figures and describes a plant found by Major Reinbold in Heligoland in June, 1888, which although in many respects like a *Litosiphon* he has made the type of a new genus, *Pogotrichum*. Both in the Gare Loch and at Weymouth I have found an alga agreeing in all essential particulars with the Heligoland plant, for specimens of which I have to thank Major Reinbold, but more slender, the fronds usually consisting of only one row of cells, filaments with more than a single row being very rarely met with. I propose to

* This list can now be procured in a separate form from the publishers of the "Annals of Botany."

call the British plant *P. filiforme, Rke., f. gracilis.* The new genus may be described as follows: Fronds unbranched, tufted, filamentous, growth intercalary. Vegetative cells formed of many, more rarely of a single row of cells. Plurilocular sporangia formed from isolated or from several contiguous cells of the vegetative filaments, intercalary; in individuals composed of a single row of cells formed by division of one of the cells in the continuity of the frond into a number of smaller ones. *P. filiforme f. gracilis* filaments, 4-8 m.m. in length, usually composed of a single row of cells, 15-20 $\mu$ broad, 15-30 $\mu$ long, arising from a basal disc composed of one layer of cells.

**P. Hibernicum.** *Johns. Irish Naturalist, Part I., p.* 4.

Coast of Clare, Ireland. Dr. T. Johnson, Weymouth, E. B.

In his account of the preceding species Reinke mentions that Dr. Johnson had found, on the coast of Ireland, another species of the genus *Pogotrichum* which was distinguished by the fronds penetrating the host plant instead of arising from a basal disc. Dr. Johnson, in the first part of the "Irish Naturalist," states that he intends to publish a figure and description of the plant under the name *Pogotrichum Hibernicum.* I have found the plant at Weymouth, where it appears to be not uncommon in the spring of the year, fringing the tips of *Laminaria saccharina* in shallow sandy pools near low water mark. Had it not been that the filaments, which grew in patches of considerable length, did not arise from a basal disc, but penetrated the substance of the host plant, although very slightly, I should unhesitatingly have referred my specimens to *Pogotrichum filiforme.*

**Streblonema sphæricum,** *Thur. in Le Jolis Alg. Mar. Cherb. p.* 73.

In the fronds of *Mesoglœa vermicularis.* Fairlie, E. M. Holmes, Cumbræ, E. B., not uncommon.

Fronds from 10-15 $\mu$ thick, irregularly branched, here and there angularly bent, joints about as long as broad; unilocular sporangia, sphærical or oval, 35-40 $\mu$ in diameter, sessile or shortly stalked; plurilocular sporangia ovate, acute, often containing only one row of zoospores.

**Ectocarpus minimus,** *Nægel.*

Dover, Nägeli, Berwick, E. B.

A minute species growing on the fronds of *Himanthalia lorea* and various *Fuci.* To the naked eye nothing is visible but a minute velvety coating of a yellowish-brown colour, forming patches on the frond of the host plant. The fronds are erect and very slightly branched, the sporangia ovate-acute, terminal, stalked. The whole plant bears a very close likeness to *E. terminalis,* from which it is distinguished by its fronds penetrating the substance of the host plant, while in *E. terminalis* the secondary filaments arise from a layer of more or less closely united creeping primary filaments.

**Ectocarpus tomentosoides**, *Farlow. Bullet. Torrey Bot. Club. Vol.* XVI., *No.* 1.

Weymouth.

A species related to *E. tomentosus*, but the filaments, which are seldom more than from $\frac{1}{8}$ to $\frac{1}{4}$ in. long, are from a quarter to a third narrower, the sporangia never recurved, and usually consisting of only a single row of zoospores. Furthermore the plant does not form into rope-like masses, but grows in patches, often several inches in diameter. The filaments are densely interwoven, sparingly and irregularly branched, 6-8 $\mu$ in diameter, cells short, rarely twice as long as broad, the sporangia very numerous, diverging at right angles from the filaments, sessile, linear, 60-80 $\mu$ long by 6-7 $\mu$ broad.

**Leptonema fasciculatum**, *Rke. Algenfl. p.* 50, *Atlas. t.* 9, 10.

On *Zostera*. Cumbræ.

The filaments of this minute plant are at first simple, and arise in tufts from a horizontal branched protonema, later on they become densely branched at the base while remaining simple above, when mature presenting a close resemblance to a small *Elachista*. The plurilocular sporangia are produced in the continuity of the upper portion of the filaments in the same manner as in the genus *Pylaiella;* the unilocular sporangia are oval, sessile, or shortly stalked, and are borne laterally at the base of the filaments. Filaments 10-12 $\mu$ thick.

**Ascocyclus fœcundus**, *Rke. Algenfl. p.* 46.

On *Zostera*, *Laminariæ*, etc. Cumbræ. Not uncommon.

This species is characterized by the erect filaments which arise from a monostromatic basal-disc, being entirely transformed into conical, plurilocular sporangia, which are placed side by side without any intervening sterile filaments, the place of which is taken by a few colourless, soft hairs.

**Ascocyclus fœcundus**, *Rke.* var. **seriatus**, *Rke. Algenfl. p.* 47, *Atlas t.* 16.

On *Laminariæ*, etc. Cumbræ.

This plant may be at once distinguished from the preceding by the sessile sporangia being cylindrical and containing only a single row of zoospores. In general appearance the plant greatly resembles *A. orbicularis*, but the very characteristic colourless, rigid, unicellular ascoid bodies, so marked a feature of that species, are absent. The absence of these ascoid bodies (from which the genus takes its name) led Stroemfelt to place the plant in a new genus, *Phycocelis.*

**Ascocyclus balticus**, *Reinke Algenfl. p.* 45. *Atlas t.* 16.

On *Laminariæ*. Cumbræ.

This species comes very near to the last, but may be distinguished from it by the sporangia being formed by the transformation of the upper cells of the assimilation threads, not by the transformation of the entire thread.

**Ascocyclus globosus**, *Rke. Algenfl. p.* 46. *Atlas t.* 17.

On *Cladophoræ*, etc. Cumbræ.

A rather larger plant than any of the preceding, forming almost globular patches on Cladophoræ, etc. The assimilation threads are branched, and the plurilocular sporangia are formed by the transformation of the cells of the branches. It is not clear to me in what way this plant differs from Kjellman's *Phœosphœrium punctiforme* (Handbok Hafsalg, p. 41), a species founded on the old *Linkia punctiformis*, which in my opinion is an *Ascocyclus (A. punctiformis)*.

**Ralfsia pusilla**, *Batt. Journ. of Botany*, 1892.

When examining some specimens of *As. fœcundus* on the fronds of *Laminaria saccharina* from Kames Bay, Cumbræ, I found what appears to be Stroemfelt's *Stragularia pusilla* (*Notarisia*, An. iii., fasc. 9). It formed very minute spots hardly larger than those of the Ascocyclus, but the frond, consisting of several layers of cells, was that of a Ralfsia; it is possible the plant may belong to Reinke's genus *Microsporium*.

**Chorda tomentosa**, *Lyngb. f. subfulva*, Foslie. Contrib. Mar. Alg. Norway, i., p. 87.

Cumbræ (David Robertson).

When at Cumbræ last year Mr. Robertson presented me with some specimens of *Ch. tomentosa*, Lyngb., which he had gathered in Kames Bay some years previously. These specimens appear to me undoubtedly to belong to Foslie's variety *subfulva*. The variety is smaller than the typical form (my specimens are from three inches to a foot long), the hairs clothing the frond are softer, and on drying change to a beautiful green colour instead of a dark brown. The sporangia and paraphyses are very much alike in both forms.

**Fucus Areschougii**, *Kjellm. Handbok Hafsalg. p.* 11.

England.

Kjellmans founded this species partially on the *Fucus Sherardi* of Aresch., but whether this plant is identical with the *F. Sherardi* of Stackhouse's "Nereis Britannica" I am unable to say. Judging from specimen No. 54 of Areschoug's Algæ Scandinavica, which is quoted by Kjellman as his *F. Areschougii*, the plant is not unlike *F. platycarpus*, but is smaller, with narrower fronds, and roundish receptacles destitute of the margin of unchanged frond which characterize that species. The plant is probably common on our shores.

**Erythrotrichia carnea**, *f. Ag.*, *f.* **investiens** = var. b. *Aresch. Phyc. Scand. Mar. p.* 210.

Lamlash Bay, Arran.

In this variety the fronds are swollen and irregularly bent at intervals, owing to one of the articulations being composed of more than a single cell.

**Conchocelis rosea**, *Batt. Phyc. Mem. Part* I.

Cumbræ.

One of the perforating algæ, resembling *Erythrotrichia*, but with branched fronds. The star-like chromatophores are very characteristic of the species.

**Wildemania miniata**, *Foslie Contrib.* II., *p.* 14, *f.*, **tenuissima**, *Foslie.*

Cumbræ. D. Robertson.

When at Cumbræ Mr. Robertson gave me specimens of this plant, which he had gathered in the spring of the year in the channel between Cumbræ and Little Cumbræ. Except in the thickness of the frond, forma *typica* differs very slightly from this variety.

**Antithamnion boreale**, *Kjellm. Alg. Arct. Sea*, *p.* 180.

Lamlash Bay, Cumbræ.

This species certainly comes very near to *A. plumula*, Thur., but is a more slender plant, with longer, thinner, less branched fronds, and with fewer secund ramuli; the joints of the main stem, too, are longer than in *A. plumula*.

**Gonimophyllum Buffhami**, *Batt. Journ. of Bot.* 1892.

Deal. T. Neeve.

This very interesting plant forms minute leafy tufts on the fronds of *Nitophyllum laceratum*, Grev. These tufts might be taken for abnormal fruit-leaves of the host plant, but they arise from a small hemispherical cushion, composed in part of the filamentous basal portion of the parasite, and in part of the distorted tissues of the host plant. The external portion of the parasite is that in which the reproductive organs are produced. Cystocarps, tetraspores, and antheridia are much like those of *Nitophyllum*.

**Rhodochorton minutum**, *Rke. Atlas*, *t.* 40 (*text*), *Reinbold, Schrift., Naturwiss, Verenis Schleswig., Halst., Band* IX., 1891.

Weymouth. Epiphytic on *Polysiphonia urceolata*, Grev. Summer.

Fronds minute, isolated, or in tufts; the vertical threads arising from branching primary threads, more or less secundly branched, the branches again beset with short ramuli, ending in a long colourless hair, tetraspores sessile or shortly stalked, situated on the branches either singly or in pairs. Fronds scarcely 1 m.m. in height.

**Schmitziella endophlæa**, *Born. et Batt. Annals of Botany, July.* 1892.

Torquay, Anglesea, Puffin Island. On *Cladophora pellucida*, Kuetz.

Resembling *Melobesia callithamnioides*, Falkbg., in the formation of the frond; this minute endophyte, which forms pink stains on the stems of *Cladophoræ*, differs from all the other members of the *Corallinaceæ* in producing its fruit in sori, which are not enclosed by a distinct pericarp. The entire plant grows between the exterior layers of the cell-wall of the host plant.

**Lithothamnion corallioides, *Crn., f.* subsimplex,** *Batt. Journ. Bot.*, 1892.

Cumbræ.

A variety characterized by the entire absence of lateral branches, the fronds being quite unbranched, slender, angularly bent or straight.

**Lithothamnion colliculosum,** *Foslie Contrib.* II., *p.* 8.

Cumbræ, in from 8-10 fathom water.

This species covers small stones with a thin pink crust, 0·5-1·5 m.m. in thickness, covered with short, simple tubercles from 3-4 m.m. in height, either tapering to a point or cylindrical, apices obtuse.

## BIBLIOGRAPHY.

*Beiträge zur Kenntniss der Ectocarpus-arten der Kieler Föhrde* (Contributions to a knowledge of the species of Ectocarpus of Kiel Haven). By Paul Kuckuck ("Botanisches Centralblatt," Band 48, No. 1 *et seq.*)

With the exception of Kjellman's monograph on the Scandinavian species, which was published in 1872, the difficult genus *Ectocarpus* has received so little attention of late years that M. Kuckuck's paper dealing with all the species and forms of the genus to be met with in Keil Haven is doubly welcome.

Like Kjellman the author rejects the Kuetzingean genus *Corticularia*, which was based on a very variable character, viz., cortication, but differs from him in also rejecting Bory's genus *Pylaiella*, the typical species, *P. litoralis*, of which differs but little, according to M. Kuckuck, from *Ectocarpus siliculosus*. *Pylaiella* was supposed to differ from *Ectocarpus* by both the unilocular and plurilocular sporangia being intercalary, but, according to the author, the plurilocular sporangia of *E. siliculosus* not only often terminate in a hyaline hair but also frequently in a row of cells provided with chromatophores, while on the other hand the variety *divaricata* of *Pylaiella litoralis* has terminal plurilocular, and the variety *varia* terminal and stalked unilocular sporangia similar to the corresponding sporangia of other *Ectocarpi*, and lastly intercalary unilocular sporangia are, according to Reinke (Atlas, t. 20, fig. 6), found on *Ect. ovatus;* similar cases have also been observed by the author on *E. penicillatus*.

The opinion that *Streblonema* is also only a form of *Ectocarpus* receives support from some cases studied by M. Kuckuck, in which he found plurilocular sporangia similar to those figures by Pringsheim for *S. fasciculata* on *Ectocarpus dasycarpus*, n. sp., which has a well developed, not a creeping thallus.

The author thinks Reinke wrong in uniting to *Ect. confervoides* all those Baltic *Ectocarpi* possessing ribbon-shaped branching

chromatophores, for those of *E. tomentosus*, Huds., are also ribbon-shaped and frequently spirally twisted.

Following the example of Kjellman (Handbook), M. Kuckuck retains *Ect. siliculosus*, Dillw., sp., *Ect. confervoides*, Roth., sp., and *Ect. penicillatus*, Ag., as distinct species, but he reduces Kjellman's *Pylaiella varia* to the rank of a variety of *Ect. litoralis*. One new species, *Ect. dasycarpus*, characterized by its slender, blunt, cylindrical, terminal sporangia of variable length up to 250 $\mu$, but very constant width 10-15 $\mu$, is described. The paper, which it should be remarked is illustrated by six excellent figures of *Ect. siliculosus*, *E. confervoides*, *Ect. dasycarpus*, and *Ect. peniculatus*, concludes with an account of the morphology of the species described.

*Ectocarpus siliculosus, Dillw., sp., forma varians nov. f. ein Beispeil für ausserordentliche Schwankungen der pluriloculären Sporangienform* (an example of extraordinary variation in the form of plurilocular sporangia). By P. Kuckuck, Berichte der Deutschen Botanischen Gesellschaft, June, 1892).—In this paper, which may be considered a continuation of the one mentioned above, M. Kuckuck describes and figures a very interesting form of *E. siliculosus* characterized by the very extraordinary variety of shapes assumed by the plurilocular sporangia, which may be either bluntly cylindrical, 2-3 times as long as broad, with swollen compartments, or ovate cylindrical, or filiform up to 34 times as long as broad, sessile or stalked, terminal or intercalary.

Had not the author met with all the forms of sporangia on filaments from the same tuft he would have thought that the form with short truncate sporangia and swollen compartments was a distinct species related to *Ect. Reinboldii*, Rke., but differing from it by the zoospores escaping by a common opening situated either at the apex, side, or base of the sporangia, not through many openings, one to each compartment as in that species.

*Atlas der deutscher Meeresalgen.* By J. Reinke.—The third, and, we regret to say, concluding, part of Dr. Reinke's great work has at last made its appearance. Originally it was intended to publish six parts containing in all 150 plates; the greater part of this programme, however, has, from want of means, had to be abandoned, only three parts containing 50 plates having actually been printed. No book dealing with the marine algæ on quite so imposing a scale has been published since the appearance of the superb "Etudes Phycologiques" and "Notes Algologiques" of Bornet and Thuret. Throughout, the volume is a record of the thorough and scholarly manner in which Dr. Reinke treats any subject he attempts, and it will be of the utmost importance in advancing the study of algology. It is scarcely necessary to say that great skill and care have been bestowed on the execution of the admirable plates, and that great credit is due to all concerned in their execution. The present part contains the description and

figures of a new species of *Ectocarpus*, *E. Reinboldii*, characterized by the form of the sporangia which are borne in a more or less secund manner on the lateral branches, and are oval-cylindrical, sessile, or more rarely shortly stalked or intercalary, the compartments swollen outwardly and each perforated by a hole through which the zoospores escape, and of *Pogotrichum filiforme* the type of a new genus closely related to *Litosiphon*, Harv.; the filaments, however, frequently consist of a single row of cells, which is never the case in that genus. In addition to these the following species are dealt with in detail :—*Stilophora rhizodes*, Ehrh., sp., *S. tuberculosa*, Fl. Dan., sp., *Halorhiza vaga*, Kuetz., *Chordaria flagelliformis*, Fl. Dan., sp., *Chordaria divaricata*, Ag., *Rhodochorton minutum*, Suhr. (*R. minutissimum*, Suhr., on plate). *Sphacelaria cirrhosa*, Roth., sp., *S. racemosa*, Grev., var. *arctica*. *S. olivacea*, Dillw., sp., *S. plumigera*, Holmes, *S. plumula*, Zanard, *Stypocaulon scoparium*, *f. spinulosum*, Kjellm., and *Chætopteris plumosa*, Lyngb., sp.

*Note sur quelques Ectocarpus.* By E. Bornet (Bull. de la Soc. Bot. de France, 1892).—Despite the fact that all the observers who have studied the *Ectocarpi* agree in stating that the spores from either of the forms of sporangia germinate freely without having previously conjugated, it is usual to say that the plurilocular sporangia of this genus are gametangia, and the unilocular, zoosporangia. Dr. Bornet reminds us, however, that this generalization is based on but three observations bearing upon two species, that the authors do not agree as to the way in which it is accomplished, and that many facts have been recorded which tend to show that the reproduction of the *Ectocarpi* is neither so simple nor so uniform as has been represented. In *Ect. secundus*, for example, in addition to the usual sporangia, bodies which there can be little doubt are really antheridia, also occur. These antheridia contain antherozoids, which are much smaller than the spores contained in the plurilocular sporangia and in most respects are closely analogous to the antheridia of Tilopteris, etc. In *Ect. pusillus*, Griff. (which according to the author is identical with Askenasky's *E. ostendensis*) on the other hand the plurilocular sporangia contain a few large, motionless spores about 20 $\mu$ in diameter. If, then, we attempt to find a place for these two species in the classification of the Phæosporeæ proposed by Kjellman in his "Handbok" we would be compelled to place *E. secundus* among the Gynocrateæ and remove it from the true Ectocarpi, while a new order, the author suggests *Acinetosporeæ*, intermediate between the Ectocarpeæ and Tiloperideæ, would have to be made for the reception of *E. pusillus*, Griff., which would in that case become the type of a new genus *Acinetospora*. At present, however, the author considers it better to adopt Thuret's view that the first place should be given to morphological, not physiological characters, in which case the genera Ectocarpus and Tilopteris, which are so closely related in most respects, need not be separated

by the entire group of *Phæosporeæ*, while within the genus *Ectocarpus* the relative size of the spores issuing from the unilocular and plurilocular sporangia need not be regarded as of more than specific value, for it seems contrary to nature to separate generically such species as *E. secundus* and *Ect. granulosus*.

In the same paper notes are given on *Ect. globifer*, Kuetz, which proves to be the same species subsequently named by the Crouans *E. insignis*, and by Keutzing himself *E. pusillus*, although a very different plant from the one Mrs. Griffiths described under the same name ; *Ect. crinitus*, Carm., probably identical with *E. pusillus*, Griff., which has similar plurilocular sporangia ; *Haplospora Vidovichii*, Born., identical with Hauck's *Ect. crinitus*, and on the antheridia of *Tilopteris Mertensii*.

*Note sur l'Ostracoblable implexa*, Born. et Flah. By E. Bornet ("Journal de Bot.," Dec., 1891).—In their paper on the plants living in the shells of molluscs ("Bull. de la Soc. Bot. de France," xxxxi., 1889), MM. Bornet and Flahault describe under the name *Ostracoblable implexa* a plant which in the absence of fructification they took to be a fungus. In the present paper Dr. Bornet states that further researches have convinced him that the filaments described in the paper just quoted are really the hypæ of the gonidial layer of *Verrucaria consequens*, Nyc, the algal portion of which is composed of *Mastigocoleus testarum* and *Hyella cæspitosa*. The hypæ of *V. consequens* are, therefore, capable under certain conditions of living in an isolated condition without uniting with an alga to form a lichen. It is probable that *Lithopythium gangliiforme* is also the hypal portion of a lichen, but at present Dr. Bornet has not been able to definitely prove this.

*On the structure and development of the cystocarp of Catenella Opuntia*, Grev. By R. J. Harvey Gibson, "Journ. Linn. Soc.," xxix., 1892.—The cystocarps of *C. Opuntia* are borne on the erect branches and are immersed in their substance, the fertile branches are then nearly spherical and surrounded by a hyaline border. Each fertile ramulus consists of a small medulla of short, interwoven, almost colourless cells, round which and connected with it are rows of branching cells that form the reticulum which gradually merges into the coloured cortical layer ; numerous carpogenic systems arise from the cells of the branches immediately below the cortical layer, through which they penetrate and appear on the surface as delicate colourless hairs. After fertilization the uppermost of the central row of cells enlarges, and from it and the hypæ surrounding it are given off rows of carpospores. Though the trichophoric systems are very numerous only one cystocarp is produced. The author considers that fertilization is indirect ; for instead of the carpospores being produced from cells immediately beneath the trichogyne they are developed in chains from the medullary network of cells continuous with that from which the trichophoric cells and trichogynia arise.

*On the cystocarps of some species of Callophyllis and Rhodymenia.* By J. B. Carruthers, "Journ. Linn. Soc.," xxix., 1892. —In her paper on the cystocarps of *Callophyllis laciniata*, Kuetz. ("Linn. Journ.," xxxiii., p. 205-208), Miss Smith states that her investigation led her to the conclusion that to each fruit there are numerous procarps, many of which become fertilized, the results being not a simple cystocarp, but a group of cystocarps. Furthermore she states that the procarp divides up by walls parallel or at right angles to each other into a mass of large cells, which divide again in all directions to form the spores.

According to Carruthers, however, the cystocarp of *Callophyllis* is a simple body. From the procarp, probably, originates the fertile cell rows of the gonimoblast, which grow as thin filaments through the interstitial tissues between the large cells of the young fruit nucleus, and form, with these interstitial cells and rhizodes, a compact filamentous interweaving. In this filamentous tissue at different points small cavities appear, from the sides of which arise numerous short lateral, simple or dichotomous branches, at the base of which clusters of cells, finally transformed into spores, are formed.

*Phycological Memoirs* (edited by George Murray).—The first part contains the following :—

*On Splachnidium rugosum, Grev., the type of a new order of Algæ.* Margaret O. Mitchell and Frances G. Whitting.—The leading feature of the new order is based on the supposition that the sporangia are non-sexual and contain zoospores, a supposition that less enthusiastic algologists have not ventured to affirm from an examination of dried or spirit material.

*On a fossil alga belonging to the genus Caulerpa from the oolite.* George Murray.—The new species is called *Caulerpa Carruthersii.* The reiterated statement that the fossil in question may not be an alga after all shows that the author is not dogmatic ; but then, why create a new species ?

*On the structure of Dictyosphæria Decne.* George Murray.—The mass of cells constituting an individual are shown to be held together by tenacula, agreeing with those described in *Struvea, Boodlea*, etc., by the same author. In *D. favulosa* there is an aggregation of similar cells held together by tenacula, and not forming a definite frond. This is considered as illustrating the most reduced form of siphoneous thallus.

*On Malformations of Ascophyllum and Desmarestia.* Ethel S. Barton.—This may be considered as a continuation of the subject commenced in *Journ. Bot.*, March, 1891. In *Ascophyllum nodosum*, the malformations consist of round swellings or lumps, forming a corrugated surface in the vicinity of the air-vesicles. The swellings are caused by a nematode, which proved to be new to science —*Tylenchus fucicolus* De Man and Barton.—In *Desmarestia aculeata* the galls are caused by a copepod ; species not determined.

*On Conchocelis, a new genus of perforating algæ.* E. A. Batters.—The special interest attaching to this alga consists in the fact that it is of a beautiful carmine colour, and apparently belongs to the Porphyraceæ, whereas the eight genera of perforating algæ previously known belong either to the Cyanophyceæ or the Chlorophyceæ.

The alga is met with in empty shells of various species, and betrays its presence by a pink stain on the surface of the shell. "Liquide de Pérény" was found to be the best decalcifying agent. The alga, when removed from the matrix, is seen to consist of branched, interlacing, septate filaments, which, in young specimens, radiate from a central point. The filaments are of various widths and very irregular in the mode of branching, the lateral shoots sometimes anastomosing, and the whole forming a horizontal network running in the superficial layer of the shell. Below this layer the filaments produce here and there irregularly shaped, septate inflations that are much more robust than the ordinary cells. The centre of each of these inflated cells is occupied by a stellate chromatophore. These inflations often become detached from the parent plant, and are capable of an independent existence. The plant also appears to be reproduced by spores formed in the inflations, one spore in each cell.

The form and colour of the chromatophores, also the mode of spore-formation, suggest a relationship with *Erythrotrichia*, from which, however, the present genus is sharply separated by the branched frond and peculiar inflations.

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## LICHENS.

The following new British lichen was described by G. Massee in the "Journal of Botany," July, 1892.

**Verrucaria lætevirens**, *Mass.*

Thallus forming a broadly effused, rather thick, inseparable film, very smooth and even, not cracked, rather gelatinous, bright olive green, the lobed margin paler and yellowish; gonidia protococcoid, globose, 12-15 $\mu$ diam.; perithecia minute, crowded, globose, entire, black, completely immersed in the thallus, ostiolum forming a very minute, slightly raised black ring; asci clavate, spores 8, inordinate, 1-celled, elliptical, colourless, 11-12 × 6 $\mu$; paraphyses scanty, slender, cylindrical; spermagonia immersed, mixed with the apothecia, sterigmata filiform, simple, aseptate, spermatia cylindrical, straight, 8-9 × 2 $\mu$.

Hab. On smooth rocks between tide-marks. Berwick-on-Tweed and Burnmouth, on the east coast; Loch Goil, Cumbrae, and Gare Loch, on the west. (E. A. Batters.)

There are at least sixteen British marine Lichens included under the somewhat heterogeneous collection called *Verrucaria*. The

present species is distinguished amongst these by its broadly expanded, perfectly smooth, bright green thallus, presence of paraphyses, and form of sterigmata and spermatia. Its nearest ally is *V. microsporioides*, Nyl.

A careful search on our maritime rocks would very probably result in the discovery of marine lichens that are already recorded for other European shores.

**Verrucaria pulposa**, *Leight.*

In "Lichen Flora," Ed. 3, p. 457, this species is described as having *numerous spores*. An examination of Leighton's type specimen, now in the Kew Herbarium, shows that the spores are eight in number, 3-septate, deeply constricted at the septa, dark vinous-brown, breaking up into 32 cells at maturity. Asci clavate, with very long, slender pedicels; paraphyses absent.

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## Bibliography.

*A Study of the Natural Classification and Morphology of the Lichens of Brazil.*—Dr. E. A. Wainio, in an independent publication (Helsingfors), indicates the outlines of a new system of classification of lichens, based on the critical examination of a collection made by the author in Brazil. The chief features of the new system are discussed under the following headings:—

*Introduction.*—The discovery of the complex nature of lichens, which consist of forms of Ascophytes (Ascomycetes), that live in a state of symbiosis with algæ (gonidia), has deprived all existing schemes of classification of their fundamental base, which rested on the false hypothesis that the gonidia were formed from the hyphal portion of the structure, hence such schemes convey false impressions as to the inter-relationship between Lichens, Fungi, and Algæ.

A more or less marked difference in the structure of the gonidia, unless accompanied by differences in the organs formed by the hyphæ, cannot be considered as affording a sufficient base for the establishment of principal groups.

*Do Lichens form a natural group distinct from the Ascomycetes?*—Up to the present time the difference in the organs of fecundation has been considered as one of the distinctive marks between Lichens and Ascomycetes. The spermatia developed in the spermogonia are generally considered as the male organs of fecundation in Lichens, the carpogonia with their ascogonia and trichogynes, discovered by Stahl, being considered as the female organs. In the Ascomycetes, on the contrary, the pollinodia and ascogonia are usually considered as the sexual organs.

The author does not accept the sexual nature of the organs mentioned above for the following reasons:—(1) The formation of ascospores in numerous species without any previous fecundation. (2) The discovery by Möller that the spermatia of lichens ger-

minate and produce a normal thallus, thereby indicating that these organs are analogous with the conidia of the Ascomycetes. (3) The fact that the trichogynes are in general divided into several cells by transverse septa, a condition opposed to the idea of their being intermediate organs in the fecundation of the ascogonia. For the above reasons it is considered that the presumed sexual organs afford no essential point of distinction between the two groups under consideration. It is further suggested that the ascogonia represent a special kind of receptacle containing nutritive material for the formation of the ascospores, or constitute a stage of development of the hyphæ preceding the formation of asexually produced asci. It is also suggested that the so-called trichogynes are nothing more in structure or function than hairs in general, accidental prolongations of the ascogonium, which, owing to the excess of nutritive material, grow with exceptional vigour.

A characteristic feature of the higher lichens is the highly organized thallus, comparable with the stroma of the Ascomycetes; but here again a transition can be traced through the lower lichens until a type of stroma occurs distinguishable from that of the parent group—the Ascomycetes—only by the presence of gonidia.

Again, the presence of lichenine is characteristic of lichens, and can be demonstrated by the use of iodine in the hymenium of most of the higher forms, but gradually disappears in the lower lichens approximate to the Ascomycetes; consequently, although characteristic of lichens, lichenine cannot be considered as a crucial test.

From the above statements it will be seen that the only general character separating lichens from fungi is a biological one—their symbiosis with algæ.

*Intermediate forms between Lichens and Ascomycetes.*—Many authors, adhering to the hypothesis that the gonidia are produced by the hyphal elements, have placed amongst the lichens numerous species not possessing gonidia, *i.e.*, species of *Arthonia*, *Calicium*, etc.; also numerous species parasitic on lichens. So far as the parasitic species are concerned, it is possible that they may be true lichens, and for their symbiosis, profit by the gonidia of the plant on which they are parasitic.

The parasitic species without gonidia technically belong to the fungi, although in many cases giving the same reaction with iodine as the greater part of lichens.

It cannot be disputed but that the Pseudo-lichens—so-called lichens without gonidia—resemble so very closely the corresponding genera of lichens, that they are distinguished solely by the absence of gonidia.

The above statements illustrate clearly the great affinity between the Lichens and Ascomycetes, and at the same time form a connecting link between the two.

At the same time this transition of the genera of Lichens to

those of the Ascomycetes belonging to the different groups proves that *Lichens consist of a polyphyletic group, characterized by analogous biological phenomena*, and illustrated by the analogous development or "lichénization" of a certain number of Gymnocarpous and Angiocarpous genera of fungi. It follows that the *Lichens do not constitute a distinct systematic group*, but belong in part to the Gymnocarps (Discomycetes, in the broader sense), and in part to the Pyrenocarps (Pyrenomycetes, in the broader sense) among the Ascomycetes.

*Analogous evolution of the Thallus in different groups.*—In the Lecanoreæ, Thelochisteæ, Buellieæ, Pannarieæ, Collemeæ, Lecideæ, also in the Coniocarpeæ and in Pyrenolichens, types of thallus occur passing from crustaceous and squamulose through foliaceous to fruticulose; intermediate forms also usually occur in the same groups, thus indicating that the last-mentioned stage of development is only a more perfect condition of the first-mentioned form, and is produced in an analogous form in the different groups. A classification of Lichens, the principal groups of which are characterized solely by the usual aspect of the thallus, cannot be natural.

*Analogous evolution of spores in different groups.*—The remarks on the evolution of the thallus and its consequent absence of value as a primary factor in the formation of important sections apply with equal force to the spores. The evolution of the spores is, on the whole, too capricious and of unequal ratio of development in proportion to the thallus in the various groups to be of more than secondary value in classification. In the Thelochisteæ, Buellieæ, Peltigereæ, Sticteæ, Pannarieæ, Heppieæ, and several other tribes, the spores are very constant; also in the Gyrophoreæ and the Parmeliææ, highly developed from the point of view of the thallus, the spores are colourless and simple with the exception of a certain number of species, where the spores are brown and parenchymatous (=muriform), as in *Umbilicaria pustulata* (L.), Hoffm., and *Atestia Loxensis* (Fee.), Trév., which from their external aspect are distinguished with difficulty from nearly allied genera, *Gyrophora* and *Alectoria*.

The spores are singularly variable in the genera *Lecidea* and *Graphis*, which on this account have been divided by several authors into a greater or less number of distinct genera.

In this case, as usual, the classification cannot be other than artificial if the divisions are based on one preconceived idea which can be shown to have different values in different groups.

*Groups characterized by the gonidia.*—Several forms of gonidia occur in most tribes. In the Peltigereæ, Sticteæ, Pannarieæ (Lecideæ), also in the Pyrenolichens, gonidia occur belonging to both the Cyanophyceæ and to the Chlorophyceæ, and in some cases groups exist that cannot be distinguished from each other by any other character except that in one of the groups the gonidia belong to the Cyanophyceæ and in the other to the Chlorophyceæ. As

illustrations of this statement may be given *Glœocapsidium* and *Protococcophila* in the genus *Lecidea; Emprostea* and *Peltidea* of the genus *Peltigera*.

It is found in consequence that in certain groups the gonidia afford a distinctive character of primary importance, accompanied by other characters of great weight. In other instances the differences of the gonidia coincide with specific differences, or constitute unimportant groups that are not characterized, except by the gonidia.

For the above and other reasons it is not considered safe to found a natural classification on exclusively biological and physiological characters.

*The disposition of gonidia.*—The disposition of gonidia has been unanimously considered a character of great importance. On this feature Flotow divides Lichens into two series, *Lichenes Heteromerici* and *Lichenes Homœomerici*, which corresponds in its principal features to the families *Lichens* and *Byssaceæ* of E. Fries, and to the *Collemaceæ* and *Lichenaceæ* of Nylander. A minute examination showed that, as a general rule, gonidia are only present in certain parts of the medullary layer of the thallus, where they receive sufficient light for their development. Certain parts of Lichens, especially the cortical layer and the hypothallus (also the marginal portions), are for some yet unexplained reason almost destitute of gonidia, and when exceptions occur, as the presence of gonidia in the cortical layer, as in *Peltigera apthosa*, they often cause the deformations known as *cephalodia*.

The hymenium rarely contains gonidia, yet in a small number of *Pyrenolichens* and in the group *Gonothecium* (Wainio) of the genus *Lecidea* hymenial gonidia are present, and always differ in appearance from the gonidia of the thallus, and probably belong to a distinct species.

In most genera of the higher Lichens the presence of gonidia is constant in the excipulum, consequently this character is unanimously considered as one of great importance in the discrimination of genera and tribes. In *Stereocaulon*, *Placodium*, *Pyxine*, *Stictis*, *Gyalecta*, and numerous genera belonging to *Pyrenolichens*, the presence of gonidia in the apothecia is not always constant, and even when so their presence does not coincide with other more important characters; consequently they can only serve as characters for secondary groups. In *Gyalecta perminuta* (Wainio), in the same specimen, gonidia have been seen in certain apothecia, whereas in others they are entirely absent.

The gonidia present in the excipulum are always, by one method or another, an extension of the gonidia existing in the thallus.

*(To be continued.)*

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# Grevillea.

A QUARTERLY RECORD OF CRYPTOGAMIC BOTANY AND ITS LITERATURE.

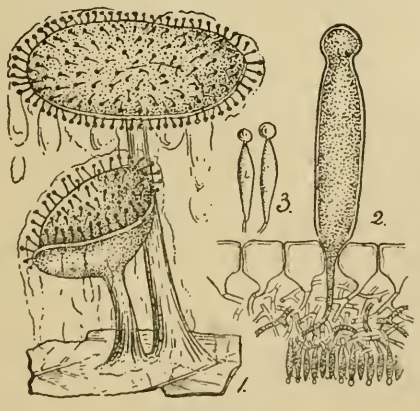
## FUNGI.

### Notes on Fungi in the Royal Herbarium, Kew.

By George Massee.

**GLOIOCEPHALA.** *Mass.* (n.g.)

Hymenophore circular, plane, the upper sterile surface bearing numerous large, projecting cystidia which secrete a considerable quantity of hyaline mucus; hymenium covering the entire under surface of the hymenophore, and consisting of closely packed basidia, each bearing a single spore at the apex; stem central, composed of a fascicle of transversely septate hyphæ.




*Gloiocephala epiphylla.*

The type of the present genus resembles in general appearance a miniature agaric; the stem is composed of a bundle of closely agglutinated, transversely septate, thin-walled hyphæ, that become free from each other at the base and spread for some distance over the surface, and also enter the tissues of the decaying leaf on which the fungus grows. At the apex the stem expands abruptly into the thin, flat, circular pileus or hymenophore, and forms a central interwoven layer consisting of cylindrical septate hyphæ of equal diameter to those of

the stem. Certain lateral branches of the intermediate layer grow upwards, and become much inflated at the apex; these inflated tips form the upper, sterile surface of the pileus, and in section resemble the palisade tissue of a leaf; seen from above, these cells are flattened, irregularly polygonal, and 9-12 $\mu$ in diameter. Other branches of the intermediate layer form thin, aseptate, thin-walled hyphæ densely filled with colourless, granular contents; these hyphæ grow up between the large cells forming the upper surface of the pileus, and when they reach the surface expand into a cylindrical cystidium, varying from 60-100 × 15-20 $\mu$, and filled with granular contents. At a later stage of development a constriction appears at some distance below the apex, thus forming a more or less spherical head; finally, at maturity, the globose heads of the cystidia deliquesce, and a large quantity of colourless mucus escapes, which completely involves the whole fungus in a hyaline envelope. The basidia originate from the hyphæ of the intermediate layer, and are more or less fusiform. There are no cystidia in the hymenium, but a few are sometimes scattered on the stem.

The affinities of the present genus are difficult to indicate, in fact, technically, it does not belong to the Basidiomycetes on account of its monosporous basidia, although such occur in the Clavarieæ, and probably the present genus will be best placed near to *Physalacria* and *Pistillina*, with which it agrees in habitat, and the presence of large cystidia, being nearest to *Pistillina cycloidea*, Cke., but in these genera the hymenium covers every portion of the hymenophore, and the cystidea are also borne on the hymenial surface. The principal feature of the genus *Gloiocephala* is the high differentiation of the hymenophore, the hymenium being confined to the under surface, and the numerous, large, mucus-secreting cystidia to the upper surface.

**Gloiocephala epiphylla.** *Mass.* (n.sp.)

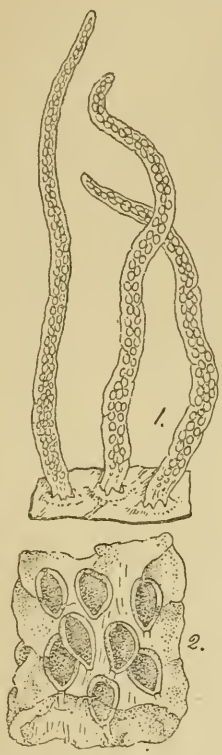
Pileus 1-2 m.m. across, very thin, circular, plane or slightly depressed in the centre, whitish and opalescent, upper surface very minutely setulose under a lens, from the numerous cystidia; basidia fusiform, 16-18 × 4 $\mu$; spores globose, colourless, smooth, 3 $\mu$ diam.; stem about 2 m.m. long, slender, slightly attenuated upwards, brownish. The whole fungus involved in mucus when mature.

On damp, decaying leaves. Jamaica.

Fig. 1, *Gloiocephala epiphylla;* entire specimens, × 150. Fig. 2, section of portion of hymenium of same, × 500. Fig. 3, basidia and spores of same, × 1000.

**Cronartium capparidis.** *Hobson, Grev. Vol.* XIV, *p.* 89.

The original description of the present species is very brief, and an examination of the type specimen reveals some points of structure not present in any described species of *Cronartium*. The following is a fuller description:—




*Cronartium capparidis.*

Filaments erumpent, slender, 2-3 m.m. long, densely crowded, curved and interwoven, bright brown, forming extended patches on the under surface of the leaf. The filaments are soft and gelatinous when moist, and consist of bright brown, smooth, obovate or broadly elliptical one-celled teleutospores loosely scattered in the central portion of a very thick, colourless, gelatinous sheath ; the teleutospores measure 25-30 × 14-18 $\mu$, and each one is furnished with a single, well-defined apical germ-pore.

On leaves of *Capparis*. Belgaum, Bombay. (Major-Gen. Hobson.)

Fig. 1, filaments of teleutospores, × 100. Fig. 2, portion of a filament, with free teleutospores, × 400.

The points in which the present fungus differs from the generic features of *Cronartium* are (1) the entire absence of uredospores; (2) the teleutospores being loosely scattered in a thick, gelatinous sheath. The teleutospores at first form a circular cushion below the epidermis, and as the spores mature the cuticle is raised, and at length ruptured, when the mature spores are expelled along with a quantity of mucus, and form a curled filament. When the teleutospores are first expelled a hyaline pedicel is more or less evident at the base of each ; these, however, eventually deliquesce, and add to the bulk of the mucilaginous sheath. The formation of teleutospores continues for some time in the substance of the leaf, and are expelled as they become mature, thus increasing the length of the filament by additions to its base.

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## AUSTRALIAN FUNGI.

### Supplement to Handbook, by M. C. Cooke.

The following are additions and corrections made since the "Handbook" was printed :—

**Agaricus (Lepiota) stenophyllus**, *Cke. & Mass. Hdbk. Austr. Fun., p. 7, No. 26.*

Pileus fleshy, soft, hemispherical, then plane, the brownish cuticle broken into depressed, persistent scales, margin incurved (to 10 c.m. diam.). Stem elongated, 15 c.m. long, 3 c.m. thick

at base, bulbous, fistulose, smooth, whitish, becoming brownish with age; superior ring broad, deciduous. Gills at first linear, then broader, free, white, at length tinged umber. Spores elliptical, 12 × 7-8 μ.

On the ground. Mount Wellington. Queensland.

A further supply of specimens from Mr. Bailey shows that the original description was drawn up from young specimens, and should be corrected as above.

**Agaricus (Lepiota) membranaceus,** *Cke. & Mass.*

Pileus thin, membranaceous, pale cream colour, convex, then expanded, umbonate, a little darker at the disc (1-2 c.m.). Stem slender, slightly bulbous at the base, hollow; ring distant, small, rather fugacious. Gills free, ventricose, scarcely crowded. Spores very minute, 3 × 2 μ.

On chips of wood buried in the ground. Queensland. (*Bailey*, 937.)

**Hiatula Wynniæ,** *Berk. Hdbk. Austr. Fungi p.* 71.

Specimens from Queensland, growing on wood, spores 5 × 4 μ, agree completely with type. (*Bailey*, 933.) It is reported as luminous, emitting a greenish light.

**Agaricus (Clitopilus) cyathoideus,** *Cke. & Mass.*

Singly or clustered. Pileus rather thin, convex, umbilicate, then infundibuliform, irregular, pallid, smooth (2-4 c.m. broad), margin incurved, even; stem nearly equal (2-3 c.m. long), a little striate, pallid (6-8 m.m. thick), hollow, white and woolly at the base, with a white floccose mycelium. Gills rather crowded, and narrow, decurrent, white becoming a little discoloured. Spores roseate, angular, irregular, 10-12 × 8 μ.

Under burnt logs. Victoria. (*Mrs. Martin*, 1054.)

**Agaricus (Hebeloma) griseus,** *Cke. & Mass.*

Single or gregarious. Pileus fleshy, convex, becoming flattened (6 8 c.m. diam.), mouse-grey or pale silver grey, glutinous, smooth, shining when dry. Stem equal, or thickened at the base when young, attenuated when old (3 c.m. long, 1-1½ c.m. thick), solid, or stuffed, whitish, a little mealy at apex; veil arachnoid, white, fugacious. Gills adnate, with a decurrent tooth, rather broad, ferruginous. Spores 7-8 × 3 μ, bright brown. Odour unpleasant.

On the ground in woods. Victoria. (*Mrs. Martin*, 1060.)

**Agaricus (Tubaria) strigipes,** *Cke. & Mass.*

Cæspitose. Pileus hemispherical, umbonate (1-2 c.m.), tawny yellow, smooth, rugose, margin incurved. Stem slender, flexuous, hollow (3 c.m. long, 1-2 m.m. thick), colour of the pileus squarrose nearly to the apex, with conical spreading scales. Gills broadly adnate, or with a decurrent tooth, rather crowded, thin, edge paler, cinnamon. Spores tawny yellow, nucleate, 6-7 × 4 μ.

In tufts amongst grass. Port Phillip. (*J. Minchin.*)

**Agaricus (Hypholoma) discretus,** *Cke. & Mass.*

Gregarious. Pileus campanulate, then convex, umbonate, smooth (2 c.m. diam.), tawny yellow. Stem slender, equal (3 c.m. long), faintly striate, paler than the pileus, a little floccose at the base. Gills free, or slightly adnate, rather broad, greenish grey, then olive, at length purple brown, edge whitish. Spores purple brown, 12 × 7 $\mu$.

On the ground. Victoria. (*Mrs. Martin*, 1056.)

Resembling *Ag. elæodes*, but spores much larger, and not cæspitose.

**Bolbitius candidus,** *Cke. & Mass.*

Pileus membranaceous, campanulate, then plane (3-5 c.m.), white, smooth, margin striatulate. Stem long (6-8 c.m.), equal, somewhat fibrous, hollow, mealy at the base, white (3 m.m. thick). Gills lanceolate, free, leaving a collar round the stem, margin serrulate, ferruginous. Spores elliptical, smooth, bright orange brown, at first binucleate, 10-12 × 6 $\mu$.

On stable refuse. Brighton, Victoria. (*Mrs. Martin*, 1052.)

**Marasmius subroseus,** *Cke. & Mass.*

Cæspitose; pileus ovate-campanulate (1-2 c.m.), membranaceous, smooth, faintly umbonate, somewhat striate, pale tan colour, tinged with pink. Stem equal (3-4 c.m. long, 1-2 m.m. thick), rather rigid, horny, hollow, smooth, becoming a little reddish downwards, and clad at the base with white pubescence. Gills distant, adnate, broad, interstices slightly veined, whitish, with a pinkish tinge. Spores 6-8 × 4 $\mu$.

On rotten wood. Victoria. (*Martin*, 1088.)

**Lenzites bifasciatus,** *Cke. & Mass.*

Pileus reniform, or shell-shaped, broadly attached at the base (1 c.m diam.), coriaceous, thin, greyish fawn-colour, with a darker fuliginous band near the margin, and one nearer the vertex, silky. Gills not crowded, rather broad, umber.

On bark. Victoria. (*Martin*, 995.)

**Polyporus (Ovini) mylittæ,** *C. & M.*

Pileus fleshy, tough, elastic, pulvinate, single or two or three together, and then deformed, convex, minutely velvety, white (10 c.m. diam.). Stem short (2 c.m. long), deformed, like the pileus, solid, flesh white. Tubes rather long (7 m.m.). Pores white, adnate ($\frac{1}{2}$ m.m.), somewhat angular, edge acute, smaller towards the margin. Spores elliptical, with an oblique basal apiculus, smooth, 8 × 4 $\mu$.

Growing on *Mylitta australis*. S. Australia.

A most interesting production, undoubtedly the ultimate development of the Sclerotium long known as *Mylitta australis*.

**Dædalea illudens,** *Cke. & Mass.*

Pileus coriaceous, thin, decurrent behind (4 c.m. broad), velvety, becoming nearly bare, grey, with darker linear concentric zones, sometimes laterally confluent or imbricate; margin acute; hymenium whitish; pores near the margin and when young

porose, then sinuose, narrow (compound at base), dissepiments thin.

On trunks, etc. Kumuburra, Victoria. (*Martin*, 1026, 1037.)

Near *D. unicolor*, but thinner, more delicate; pores not lacerated.

**Hydnum (Resup) calcareum**, *C. & M.*

Chalky white, opaque, broadly effused. Subiculum adnate, crustose, smooth, mealy, indeterminate, extreme margin naked. Spines fasciculate at the base, subulate at the apex, rather brittle (2 m.m. long); spores elliptical, $3 \times 1\frac{1}{2}$ $\mu$.

On bark. Victoria. (*Martin*, 1027.)

**Stereum pannosum**, *Cke. & Mass.*

Cæspitose, connate, sessile. Pilei soft, spongy, flexible, reflexed (2 c.m. or more), pale umber, velvety, concentrically zoned with elevated bands of the same colour, becoming pallid behind with age. Hymenium creamy-white, smooth, compact, at length cracking. Spores small ($3 \times 2$ $\mu$), hyaline.

Amongst moss and on the ground. Victoria. (*Mrs. Martin*, 1067, 1071.)

Something like *Stereum Micheneri*, B. & C., superficially, but evidently quite distinct, with the appearance of a *Thelephora*.

**Cyphella longipes**, *Cke. & Mass.*

Gregarious, membranaceous, white. Pileus narrowly infundibuliform, 2 m.m. broad, 4 m.m. long, attenuated downward into a long thin curved stem, 5 m.m. to 1 c.m. long, wholly smooth, thickest above, as it passes imperceptibly into the pileus. Spores pip-shaped, $7 \times 6$ $\mu$.

On bark in wet scrubs. Queensland. (*Bailey*, 938.)

**Stephensia arenivaga**, *Cke. & Mass.*

Subglobose, irregular, or at length collapsed and cerebriform (4-6 c.m. diam.), pale, soft, becoming indurated, accumulating particles of sand, which become closely adherent; gleba soft, dirty white, shrinking, and becoming irregularly lacunose; asci clavate, sporidia 8, irregularly clustered, globose, smooth, hyaline (10 $\mu$ diam.).

In sandy soil. Elder Exploring Expedition. (*Mueller.*)

**Diploderma sabulosum**, *Cke. & Mass.*

Subglobose (2-3 c.m. diam.), pallid. External peridium thick, subgelatinous, collecting grains of sand, and becoming consolidated into a firm subglobose ball. Inner peridium membranaceous, persistent, soon free within the outer hard shell, silvery white. Capillitium radiating, consisting of parallel fibres. Gleba dirty white. Spores elliptical, smooth ($14 \times 7$ $\mu$), pallid, with a faint tinge of ochre.

On sandy soil. Elder Exploring Expedition. (*Mueller.*)

**Sphærella Goodiæfolia**, *Cke.*

Epiphyllous. Spots orbicular, definite, brown, with a circumscribing darker line. Perithecia minute, innate, gregarious on the spots, scarcely visible. Asci clavate, octosporous. Sporidia

narrowly elliptical, uniseptate, not constricted at the septum, hyaline, 10-12 × 4 μ.

On leaves of *Goodia latifolia*. Frankston, Victoria. (*Morrison*, 2.)

**Puccinia Geranii**, *Corda Icon.* IV., *f.* 36. *Sacc. Syll.* 2409.

Spots none; sori small, brown, pulverulent, on the under surface; uredospores globose or subglobose, pale brown, epispore minutely warted (14 μ diam.). Teleutospore-sori intermixed, minute, nearly black, solitary, or scattered, teleutospores oblong, constricted in the middle, thickened at the apex, and conically attenuated, often oblique, even, yellowish-brown, upper cell darkest (30-33 × 12-14 μ); pedicels elongated, thick, hyaline.

On leaves of *Pelargonium australe*. Victoria. (*Morrison.*)

**Oospora rutilans**, *Cke. & Mass.*

Effused, crustaceous, red or orange-red, conidia subglobose, concatenate, with granular orange protoplasm (12 μ diam.), arising from slender, hyaline, creeping hyphæ.

On dung. Victoria. (*Martin*, 1007.)

**Monotospora fasciculata**, *C. & Mass.*

Tufts erumpent, black, gregarious (1 m.m. long), fertile threads erect, densely fasciculate in subulate tufts, rather slender, septate, brown, conidia ovate or globose-ovate, even, opaque, brown, 18 × 10-12 μ.

On bark. Gipps Land. (*Martin*, 1000.)

We have apparently the same thing, on bark of *Magnolia*, from S. Carolina, the conidia being a little larger.

**Cercospora glycines**, *Cooke.*

On both surfaces, but chiefly on the upper. Spots definite, irregular, and angular, sometimes confluent, umber. Tufts gregarious on the spots, punctiform, black; threads short, densely fasciculate, slender, pale olive, conidia cylindrical, mostly curved, slightly attenuated towards one end, nearly hyaline, with a few small guttules, but not distinctly septate, 30-35 × 2 μ, longer than the threads.

On living leaves of *Glycine clandestina*. Victoria. (*Morrison*, 30.)

Closely allied to *C. Kennedyæ*, C. & M.

**Hymenula eucalypti**, *Cke. & Mass.*

On both surfaces. Pustules erumpent, discoid (½ m.m. broad), brownish, at length depressed in the centre, sporophores simple, rather thick; conidia acrogenous, subglobose, hyaline, 6 × 5 μ.

On Eucalyptus leaves. Goulburn River. (*Martin*, 861.)

**Phyllosticta Prostantheræ**, *Cke.*

Epiphyllous. Spots suborbicular, pale umber, with a raised, dark, circumscribing line. Perithecia minute, chiefly in the centre of the spots, gregarious, black, erumpent, with a minute ostiolum. Sporules ellipsoid or oval, hyaline, 8 × 5 μ, on short sporophores.

On leaves of *Prostanthera lasianthos*. Ringwood, Victoria. (*Morrison*, 35.)

# NEW OR CRITICAL BRITISH FUNGI.

By G. Massee.

**Agaricus (Omphalia) alutaceus**, *Cke. & Mass.*

Tan coloured. Pileus membranaceous, convex, then umbilicate, smooth, margin incurved, even (10-15 m.m. diam.), stem elongated, slender, hollow (3-4 c.m. long, 1-2 m.m. thick), smooth, rather paler than the pileus, as well as the gills, which are somewhat narrow and crowded, arcuate, decurrent. Spores 6 × 4 $\mu$.

Among grass and moss. Whiteliffe Wood.

With the habit of *Ag. scyphiformis*. Fr.

**Agaricus (Inocybe) adequata**, *Britz. Derm. f.* 29. *Sacc. Syll.* 3162.

Pileus campanulate, then expanded, fibrillose, tawny, wholly clad with large, closely adpressed, darker scales (8-9 c.m. diam), stem solid, pale, fibrillose (8 c.m. long, 1½ c.m. thick), almost equal, flesh dirty whitish, darker at base and vertex; gills broad, nearly straight (10-12 m.m.), rounded behind, adnexed, greyish, then umber, with a paler edge. Spores elliptic, 14-16 × 6-8 $\mu$, even.

On the ground. Castle Howard.

**Inocybe subrimosa**, *Karst.*

Pileus 2-3 c.m. across, conical, campanulate, then expanded, with a prominent conical umbo, margin often undulate, even, glabrous, the cuticle becoming broken up into longitudinal fibrils, then cracked, bay or pale rusty-ochraceous; gills very much attenuated behind, free or slightly adnexed, rather ventricose, white, then pale tan, at length brownish; basidia clavate, 30-42 × 14 $\mu$; cystidea fusoid, apex at first muriculate, 65-95 × 14-20 $\mu$; spores subglobose, unequally stellately spiny, pale yellowish, 13-14 × 10-11 $\mu$ or 10-12 diam.; stem 5-6 c.m. long, 3-4 m.m. thick, solid, equal, round, polished, usually flexuous, base with a minute marginate bulb, glabrous, white, everywhere mealy, not pellucid.

Clypeus subrimosus, *Karsten Meddl. ad Soc. pro Fauna et Flora Fennica*, 1888-1891, *p.* 38; *Cooke Illus. pl.* 402 (called *Inocybe scabella*).

Amongst grass.

Flesh white, inodorous and insipid.

**Entoloma Cookei**, *Ch. Rich. Descr. et dess. p.* 559, *t.* 3, *f* 10-11. Agar (Pluteus) phlebophorus, *Ditm., var.* reticulatus, *Cooke Hdbk. p.* 118, *Cooke Illus. pl.* 422*b*.

The variety of *P. phlebophora* described by Cooke certainly has adnexed gills, and cannot therefore be a *Pluteus*, notwithstanding the fact that it grows on wood, and must henceforth be known as *Entoloma Cookei*; a species readily distinguished by having the pileus, 1-2 in. across, of a salmon colour or reddish-orange, and ornamented with pale raised ribs, anastomosing to form a network; stem about 1in. long; spores globose, minutely echinulate, 8 $\mu$ diam., cystidia absent.

**Coprinus umbrinus**, *Cke. & Mass.*

Pileus at first conico-hemispherical, then almost plane, finally splitting at the margin and revolute, 1-1¾ in. across, dark umber, coarsely sulcate up to the disc. There is usually a large white patch of the primary veil persistent at the apex, the remainder with scattered, snow-white, floccose scales; flesh exceedingly thin, umber; gills free, distant from the stem, crowded, 1½ line broad, thin, becoming black, margin persistently white; stem 4-6 in. long, 3-4 lines thick below, slightly and gradually attenuated upwards, hollow, dark umber from the first, polished and shining, base bulbous, solid, slightly rooting, sheathed with the persistent white volva, the free margin of which is reflexed about ¾in. from the base; basidia cylindrical, attenuated downwards into a very narrow base, apex truncate, 35-40 × 14-15 $\mu$; spores sooty-black, elliptic-oblong, obliquely apiculate; 17-18 × 9 $\mu$; cystidia absent.

On manured ground. Kew.

Distinguished from every other volvate species of *Coprinus* by the umber-coloured stem. When quite young the entire fungus is enclosed in a snow-white volva.

**Coprinus oblectus**, *Fries* (=Agaricus oblectus, *Bolton t.* 142).

Not seen since Bolton's time until recently collected in quantity by Mr. C. Crossland, at Halifax, Bolton's original locality. The figure by Bolton, t. 142, and reproduced in Cooke's Illustr. t. 661, is very characteristic. Basidia broadly spathuliform, truncate; spores elliptic-oblong with an oblique basal point, 16 × 8-9 $\mu$.

**Lactarius lateritioroseus**, *Karsten Medd. ad Soc. pro Faun. et Flor. Fennica*, 1888-91, *p.* 15; *emend. p.* 20.

Pileus up to 11 c.m. broad, convex with an umbilicus, soon depressed, often at length somewhat infundibuliform and wavy, often unequal, zoneless or rarely slightly zoned, flesh up to 1 c.m. thick, becoming very thin towards the margin, dry, becoming broken up at the disc into minute, granite-like squamules, scales larger towards the margin, and disappearing eventually, flesh-colour or brick-red with a rosy tinge, becoming pale; gills decurrent, rather distant, thin, up to 5 m.m. broad, often furcate and connected by veins, becoming yellowish; stem up to 7 c.m. long and 2 c.m. thick, stuffed, sometimes becoming hollow at the base; unequal, incrassated at the base, curved or flexuous, rarely straight, very slightly flocculose, colour of the pileus or paler; spores subglobose, echinulate, uniguttulate, white, 8-9 × 6-8 $\mu$; milk acrid, white.

In woods.

The British specimen measured 3½in. across the pileus; stem, 3in. long, 1in. thick.

## LITERATURE.

### *British Fungus Flora.**

After an interval of twenty-one years since the publication of the "Handbook of British Fungi," it cannot be considered inopportune to issue a new mycologic flora for these islands, the ground covered by Stevenson in his "British Fungi," and by Cooke in the second edition of the first part of the "Handbook," not being one-fourth of the whole. True it is that the Discomycetes were ably expounded by Mr. W. Phillips, and the Hypodermei by Dr. Plowright, but still not less than one-half of the total number of species of British Fungi were left outside. In this juncture Mr. Massee has come forward with a complete guide to all the fungi hitherto found in the British Islands, arranged in accordance with the views of the most recent authorities. The volume before us is one of three, in which it is announced that the whole work is to be contained, although we beg to doubt the possibility of such an achievement, since the first volume includes only the larger part of the Basidiomycetes.

The first feature which will impress the student on opening this volume will be the topsy-turvy arrangement, which is evidently original. There are people who will to the last resist any departure from the old lines, even when departure would be justifiable. On the other hand there are others whose love of variety is so great that they cannot resist the impulse of change, whether justifiable or not, so long as it is novel. Some people have credited the writer of this review with belonging to the first of the above classes, and the writer of the book under notice as associated with the latter class. If such an estimate be a true one it must be admitted that we must agree to differ, but we fancy that there is exaggeration on both sides. As for ourselves we think, for many reasons, that changes in classification and arrangement should not be made without good and sufficient cause, especially in works intended for the use of students. Hence we vote for the maximum of lucidity, with the minimum of complexity, for the maintenance, as far as possible, of old custom and tradition, but modified, and brought into harmony and consistency with the suggestions of experience and the revelations of modern science.

In the "British Fungus Flora" the first place falls to the *Gastromycetes*, the second to the *Hymenomycetes* in this first volume, and we are led to ask—wherefore? Hitherto a reverse order has been adopted, and if changed, such a change should have as its basis a good and substantial reason. In the preface we fail to discover either alleged reason or apology. Passing on to the

* "British Fungus Flora," a classified text-book of Mycology, by Geo. Massee, in three vols. Vol. i., Basidiomycetes. London: Bell and Sons. 1892.

Hymenomycetes themselves we observe that they commence with the Tremellineæ and pass on to the Agaricinæ. Topsy-turvydom is supreme throughout, but, so long as it is merely a complete reversal, there is not so much to object to provided it is logically carried out. In this case it should not have been the Basidiomycetes which occupied the first volume, but the lowest forms of fungus life, and the simplest, such as the Schizomycetes and Saccharomycetes, passing gradually upwards and onwards to the Basidiomycetes or Ascomycetes, whichever might be held to be the highest form. Passing aside this question of order as one in which each may be persuaded in his own mind, we come to another change which has the sanction of continental authorities, but now for the first time introduced into British Mycology, and that is the constituting of all the sub-genera of the large genus *Agaricus* as genera, and thus ranking such a group as *Pleurotus*, for instance, as of equal value with *Lactarius* or *Lenzites*. This is not the place to discuss such a question, but we contend that the sub-genera of *Agaricus*, as recognized by Fries, are *not* equivalent in rank to such genera as *Schizophyllum*, *Cantharellus*, *Cortinarius*, and the rest of the genera of the *Agaricini*, and should not be regarded as such. And here our growling comes to an end, for although our differences may only resolve themselves into questions of private opinion, it is but justice to ourselves to intimate that we have not yet changed our views as to systematic sequence or the relative value of genera and sub-genera. Up to now we have afforded to "keep a conscience," and hope to be able to do so up to the end.

With these reservations we are prepared to welcome the "British Fungus Flora" at a time when, we fear, that the systematic and persistent study of fungi is at a lower ebb in this country than it has been for many years. It is not too much to hope that a complete work will give an impetus to study and increase the number of students. The type and style of printing is all that could be desired. The illustrations, if rough and simple, are sufficient for the discrimination of genera, and the indices satisfactory. The descriptions of species are not confined to a bare diagnosis, but seem to be ample and to embody all essential particulars, including spore measurements, which of late years have been elevated to an almost undue importance. It may be objected, perhaps, that the quotation of authorities, and cross references to others, and well known books are too limited, but it must be remembered that any considerable increase in this direction must necessarily have expanded the bulk, and added to the cost of the work. In our humble opinion such full descriptions as are to be found under the various species of *Boletus*, for example, are a full compensation for a meagre synonymy, and similar smaller sins of omission. Personally we consider that the consecutive numbering of genera and species is a decided advantage, but that is a question of detail and not an article of faith. Undoubtedly we are prepared

to recommend Mr. Massee's new book to everybody interested in British fungi. It has come to fill a vacant place, and, we doubt not, will fill that place with satisfaction, and the quicker the remaining volumes follow the first one the better will all be pleased. It is the most pretentious work that Mr. Massee has yet attempted, and, personal idiosyncrasies notwithstanding, we believe him fully competent to carry it out to a successful termination.

M. C. Cooke.

*North American Pyrenomycetes.**

This volume, for some time promised and expected, has at length appeared, and, as far as we can judge, it will amply fulfil all expectations. It would be worse than presumption to pronounce a decided opinion on the merits of a book like this at a casual glance. It can only be a work of time, consequent upon a close acquaintance, acquired by use and investigation, that all the labour and the care with which that labour has been applied will become manifest. One of the authors has long been known to us, and esteemed by us, as a careful investigator, and we have great faith that this volume will exhibit the perseverance and careful research which has been expended in its production. It is a manifest advantage that instead of attempting a general "Handbook" our authors have confined themselves to one important mycologic group, and concentrated their energies on the Pyrenomycetes.

Nearly 800 pages of letter-press, with 41 plates, is no mean contribution to North American Mycology, and we are glad to think that it is the most important work on Mycology yet published in the United States. The type is clear and good, the descriptions ample, and the measurements, especially of the sporidia, are universally given wherever they could be ascertained. We are led to conclude that these measurements have been actually determined from American specimens, which, therefore, adds to their value. If we say that we do not fully appreciate the arrangement we may be excused, since we have not yet found a key to the principle upon which that arrangement is based. The old Friesian arrangement recognized a principle, which was intelligible, although insufficient, based on external characters. The Saccardian arrangement again follows a principle, which is at least intelligible, although we have objected that it is too artificial. The present arrangement is neither the one nor the other, and in the absence of such a key to the genera as Saccardo gives under each section, confusing and unsatisfactory. Not having accepted Saccardo's arrangement, we suggest that our authors should have given some exposition and vindication of their own. As far as we have professed to form an opinion, we consider this the weakest portion of the volume. Nevertheless, it is a valuable "contribution."

M. C. C.

* "The North American Pyrenomycetes," a contribution to Mycologic Botany, by J. B. Ellis and B. M. Everhart. 8o., with 41 plates. New Jersey. 1892.

*Vegetable Wasps and Plant Worms.**

The present work has for its object the bringing together of all known kinds of fungi that grow upon insects, and in this respect, so far as the English language is concerned, is unique. It is true that a "Memoir" bearing on the same subject was written thirty-five years ago by G. R. Gray, but, being privately printed, had a limited circulation. The present book will be of service and interest to three distinct classes—the non-scientific element, entomologists, and mycologists. To the first section, who do not wish for scientific technicalities, there is much to interest in following the transition from early romance and imagination to the statement of modern facts, bearing on such subjects as "Vegetable Wasps," "Beetle Hangers," etc.

The fungi that attack insects fall under three divisions—the Ascigerous, or *Cordyceps* group, the Laboulbeniaceæ, and the Entomophthoreæ—the general features and characteristics of which are dealt with in the introductory portion of the book.

Entomologists, whose main interest will be to ascertain the names and relationship of any fungus present on an insect, will find this a comparatively easy matter, as the hosts—insects—are arranged in systematic order, Hymenoptera, Coleoptera, etc., the name of the host being given in all cases where determinable. In addition to this, woodcuts in the text and four plates facilitate matters.

For the benefit of the mycologist, who would consider the entomological arrangement as artificial, there is a classified list of all fungi mentioned, arranged under their respective families. Finally, in the form of foot-notes, references to figures and descriptions, ancient and modern, are given for all the species.

The book is well printed, and contains full indices to hosts and fungi.

*Trametes Trogii*, Berk.—In a note in Journ. de Bot., Vol. v, p. 356, M. P. Hariot states that, being desirous of ascertaining the relationship between *Trametes Trogii*, Berk., and *Trametes hispida*, Bagl., he wrote to Professor Mattirolo, of Turin, and to Dr. Ed. Fischer, of Berne, who sent him the types of these two fungi for examination. From a careful comparison of the specimens received, M. Hariot concludes that the two presumed species are identical in every respect, and must henceforth be known as *Trametes Trogii*, Berk., the oldest name.

The conclusion arrived at by M. Hariot shows that he has, in fact, been comparing two specimens of *Trametes hispida*, Bagl., and has not seen *Trametes Trogii*, Berk., at all, but supposed he had, as one of the two specimens he received was sent as the type of that species.

* "Vegetable Wasps and Plant Worms." A popular history of Entomogenous Fungi, or Fungi Parasitic upon Insects, by M. C. Cooke, S. P. C. K., London.

The type specimen of *Trametes Trogii*, Berk., is in the Kew Herbarium, and its history is as follows :—

Several specimens were sent by Trog to Berkeley, accompanied by the following note, in Trog's writing : " Cela serait-il Trametes gallica ? Il se trouve sur des peupliers coupés et combés au bord d'un torrent."

The following description, drawn up from Berkeley's type, shows that it is quite distinct from *Trametes hispida*, Bagl. :—

**Trametes Trogii**, *Berk. In Trog's Verzeich. schweiz. Schwamme.*

Sessile, attached by a broad base, 5-10 c.m. long, 3-5 c.m. wide, semi-circular or reniform, margin acute, entire or slightly lobed, convex when young, then almost plane ; flesh about 2 m.m. thick behind, gradually becoming thinner towards the margin, white ; surface of pileus densely strigose, the fibrils elongated, fasciculate, yellowish-brown when dry, becoming partly naked with age, slightly zoned ; pores 1·5-2 m.m. deep behind, and sometimes decurrent when the specimens are imbricated, irregularly angular, averaging about 0·5 m.m. in diameter ; dissepiments thin, edges acute, minutely toothed ; spores obliquely elliptical, apiculate at the base, $7 \times 3\ \mu$.

On dead poplar. Locality not stated.

The above mistake is evidently due to a misapplication of the term *type*. As previously pointed out in this Journal, there can be but one type specimen, and if the following definitions were adhered to, similar mistakes could not possibly occur :—

(1). *Type specimen.*—The actual specimen from which the specific character of the species is drawn up.

(2). *Authentic specimen.*—A specimen, other than the type, named by the author of the species.

(3). *Typical specimen.*—A specimen agreeing in all essential points with the original specific character.

*Checking Potato Disease.*—The Board of Trade has issued a report on recent experiments in checking potato disease at home and abroad. There is a considerable amount of information on the methods of potato cultivation in different countries, also on the various modes of treatment for the purpose of checking the ravages caused by *Phytophthora infestans*. The " Life History of the Fungus " is exceedingly poor, and evidently compiled by someone unacquainted with the literature of the subject, much less with the facts of the case. There is a figure described as " Section of Leaf of Potato Plant, with Hyphæ of Fungus emerging," but the fungus lacks the features that characterize *P. infestans*, and the section of the leaf from which it emerges is not that of a potato. The reputed discovery of the oospores of *P. infestans*, by Worthington G. Smith, is accepted and incorporated as forming part of the life-cycle of the fungus, whereas it is well known that oospores are not formed in this species, the bodies seen by Smith belonging to some other fungus growing along with *Phytopthora*.

*An Entomophilous Basidiomycete.*—N. Patouillard has described the occurrence of a basidiomycetous fungus belonging to the Clavariæ, growing on a beetle collected in Equador. The fungus, at first sight, resembles an *Isaria*, but microscopic examination revealed the presence of spores borne on basidia. In the known species included in the group Clavariæ, the basidia are clavate, thickest at the apex, and gradually attenuated towards the base, whereas, in the present species, the basidia are oval and attenuated at both ends. This and other features are considered as of generic value, and the species is made the type of a new genus, characterized as follows :—

**Hirsutella**, *Pat.*

Sporophore erect, club-shaped, simple or branched, rigid, almost coriaceous. Hymenium surrounding the club, separating readily ; subhymenial layer absent; basidia sessile or nearly so, sterigmata 1-2, subulate, very long ; spores colourless.

**H. entomophila**, *Pat.*

Mycelium forming a short grey down; clubs numerous, 3-5 m.m. high, simple, cylindrical, greyish-violet, pointed and sterile at the apex ; basidia sessile or nearly so, ovoid, 8-10 × 5-6 $\mu$, bearing one very long subulate sterigma at the apex, 35-40 $\mu$ long ; spores hyaline, lemon-shaped, apiculate at both ends, 8 × 6 $\mu$.

The author places two other species in the new genus, *Pterula setosa*, Peck, growing on old polypori, and *Typhula gracilis*, Berk. and Desm., having bisporous basidia (*Revue Mycol.*, April, 1892, pp. 67).

*Symbolæ ad Mycologiam Fennicam*, Parts xxiii.-xxix., P. A. Karsten (Meddel. of Soc. pro Fauna et Flora Fennica, 1888-1891).—Numerous new species are described, and, amongst the rest, a species of *Lactarius*, *L. lateritioroseus*, Karst., which agrees exactly with a drawing I made some years ago, from a specimen found near Scarborough. The description of this species will be found amongst the New British Fungi.

The author states, p. 101, that pl. 402 of Cooke's "Illustrations" does not represent *Inocybe scabellum*, Fr., as there stated, but that it undoubtedly represents *Clypeus subrimosus*, Karst., a description of which will be found under British Fungi.

*The Ginger-beer Plant* (Phil. Trans. Roy. Soc., Vol. 183, p. 125).—Prof. H. M. Ward has investigated the nature of the compound organism popularly known as the "ginger-beer plant," which consists of transparent, yellowish-white lumps at the bottom of the fermentations. These lumps consist essentially of a symbiotic association of a Saccharomycete and a Schizomycete, both of which are new. The former is called *Saccharomyces pyriformis ;* the latter, *Bacterium vermiforme.* Both forms have been isolated, and the "ginger-beer plant" synthetically produced by mixing pure cultures of these two organisms.

In addition to the above, several other fungi and schizomycetes were constantly present, some of which appear to be new; and as foreign intruders, species of Hyphomycetes, etc., among which are mentioned *Dematium pullulans*, De By. and Low, which has elsewhere been shown to be a condition of *Cladosporium herbarum*, Fr.

*P. A. Dangeard (The Diseases of Apple and Pear Trees;* Le Botaniste, Aug., 1892) has given the results of a thorough investigation as to the causes of the numerous diseases of apple and pear trees, caused respectively by fungi, insects, alcoholic fermentation, etc. The formulæ of various fungicides and insecticides, along with mode of application, are also given. The paper is illustrated by ten plates and figures in the text, and should be studied by everyone interested in the culture of fruit trees.

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## NOTES.

The statements respecting the proprietorship of "Grevillea" that have appeared in the "Journal of Botany" and elsewhere are entirely imaginary and incorrect.

The following Societies have held fungus forays during the autumn :—

Yorkshire Naturalists' Union, at Malton, September 14th and 15th, for the investigation of the woods on the Castle Howard estate. This was the most successful foray of the season, so far as attendance of mycologists and number of fungi were concerned. *Inocybe adequata* (Britz.) was added to the British list.

The Hertfordshire Natural History Society met at Broxbourne on September 13th. Many additions were made to the county list. *Tremellodon gelatinosum* (Pers.) and *Clavaria stricta* (Fr.) have since been found by Mr. H. Warner in the same district.

The Selbourne Society (Lower Thames Valley Branch) spent half a day in Richmond Park on October 15th, and found several interesting species.

The Worcestershire Natural History Society held a foray on October 27th and 28th at Ockeridge and Shrawley Woods, in the vicinity of Worcester. Notwithstanding the previous frosts, heavy rains, and the quantity of fallen leaves, fungi were fairly abundant, including fine specimens of *Strobilomyces strobilaceus* (Berk.).

The Woolhope Club ramble extended from the 20th to 22nd September, weather rainy, fungi scarce; nevertheless, one new species, *Omphalia alutacea* (C. & M.), was met with.

The Scottish Cryptogamic Society met at Gargunnock on the 20th and 21st October. *Peziza majalis* (Fr.) was added to the British list.

## HEPATICÆ SPRUCEANÆ: AMAZONICÆ ET ANDINÆ.

Under the above title a fasciculus is being published, comprising specimens of all those hepatics described in the work "*Hepaticæ of the Amazon and Andes*," which were gathered in sufficient quantity for distribution; with a few additional ones that were left undetermined when that work was printed. The sets contain about 400 species, all named, and the price is 30 shillings the hundred.

It is hardly necessary to observe that no such extensive collection of Hepaticæ Exsiccatæ has ever been offered to the public in any country. The specimens are all named; a much larger proportion than usually found in collections of this tribe are in a perfect state, and several of them are of extreme rarity and beauty.

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## NEW OR CRITICAL BRITISH ALGÆ.

By E. A. L. Batters, B.A., LL.B., F.L.S.

**Calothrix contarenii**, *Bornet et Flahault, Ann. Sc. Nat., Ser. 7, Vol.* III., *p.* 355.

Weymouth. On wood-work. Autumn.

Fronds forming a compact, more or less circular, black-green, smooth, shining expansion. Threads closely packed, parallel, erect, slightly flexuous, reaching 1 m.m. in height and from 9 to 15 $\mu$ in diameter, lower portion decumbent and more or less swollen. Sheath thickish, colourless, or yellowish brown. Trichoma 6-8 $\mu$ in diameter, ending in a long, slender, hyaline hair. Articulations shorter than or equal to their diameter. Heterocysts one or two basal.

This species, as MM. Bornet et Flahault have pointed out, is chiefly distinguished from *C. scopulorum*, Ag., its nearest ally, by the nature of the expansion it forms, which is smooth and fleshy to the feel, and greatly resembles that of *Isactes plana*, Thur., for which, no doubt, it has often been mistaken in this country.

**Phæophila floridearum**, *Hauck., Meeresalg p.* 464.

Weymouth. On *Rhodymenia palmata*, Grev. Sept.

Thallus microscopic, consisting of irregularly-branched, articulated filaments, with one, or frequently two, long, soft, simple hairs arising from the upper surface of each cell. Cells 10-40 $\mu$ in diameter, and either equal to or many times longer than broad. The filaments creep either over the surface or between the cells of the frond of the host plant.

This and the following species were originally placed in the genus *Phæophila*, Hauck., a genus which Professor Hansgirg (Oesterr. Bot. Zeitschr., xlii., 1892, pp. 199-201) thinks there is reason for sinking in the much older genus *Ochlochæte*, Thw.

*Delesseria (Caloglossa*, Harv.) *amboinensis*, a new fresh water Floridean.—M. G. Karsten (Botan. Zeitung, 1891, pp. 265-271, t. v.) describes a new fresh water species of *Delesseria* from Amboyna, collected at more than 100 feet above the level of the sea. This species closely resembles the brackish water species, *D. mnioides* and *D. Leprieurii*, Mont., species which M. P. Hariot points out (Bullet. de la Soc. Bot. de France, Revue Bibliographique, p. 18) are found at West Point, more than sixty miles from the mouth of the Hudson, a fact which makes M. Hariot suggest that perhaps the new species is only a form of the latter species more completely adapted for an existence in fresh water.

*Phæophyceæ* (*Fucoideæ*). By M. F. R. Kjellman (Engler. et Prantl. Die Natuerlichen Pflanzenfamilien, fasc. 60, p. 176, *et seq.*)

After having given a general account of the vegetative and reproductive organs of the group, Prof. Kjellman, following the classification of his "Handbook of Scandinavian Marine Algæ," divides the Phæophyceæ into two groups, according to whether the reproductive organs are developed in conceptacles, *i.e.*, small roundish cavities sunk beneath the surface of the frond (*Cyclosporæ*), or by outgrowths from, or division of, the surface-cells of the thallus (*Phæosporeæ*). The former class contains the Fucaceæ alone, while the latter is again sub-divided into the *Zoogonicæ* and the *Acinetæ*. In the *Zoogonicæ* both unilocular and plurilocular sporangia contain a large number of reproductive bodies, which are ciliated and endowed with the power of motion. In the Acinetæ, on the other hand, the unilocular sporangium contains a single motionless spore, while the organ (Antheridium) analogous to the plurilocular sporangium contains a number of small mobile bodies. A single family (Tilopteridaceæ) is included in this latter order, all the other Phæospores being included in the *Zoogonicæ*.

In their turn the *Zoogonicæ* are divided into two groups, the one (*Gynocratæ*) characterized by the zoospores issuing from the plurilocular sporangia, and which unite to form a zygospore, being of very unequal size,—the female zoospore being very much larger than the male, includes a single family (*Cutleriaceæ*); the other (*Isogonicæ*), in which the zoospores uniting to form the zygote are of nearly equal size, includes the following families: *Ectocarpaceæ*, *Myriotrichaceæ*, *Choristocarpaceæ*, *Sphacelariaceæ*, *Encœliaceæ*, *Striariaceæ*, *Desmarestiaceæ*, *Dictyosiphonaceæ*, *Elachistaceæ*, *Chordariaceæ*, *Stilophoraceæ*, *Spermatochnaceæ*, *Ralfsiaceæ*, *Laminariaceæ* and *Lithodermataceæ*.

In the present part Prof. Kjellman deals with the two families *Ectocarpaceæ* and *Choristocarpaceæ*. In the former the growth is by intercalary cell division, while in the latter it is apical. The characters by which the genera into which the *Ectocarpaceæ* are divided are taken either from the position of the plurilocular

sporangia (*Gametangia*), whether surrounding the branches (*Zosterocarpos*, Born.) or not ; from the nature of the attachment whether effected by means of creeping filaments or an expanded disc, and whether the plant is a parasite (*i.e.*, with filaments entering the substance of the host plant) or an epiphytic. Prof. Kjellman differs from Farlow, Reinke, Kuckuck, and others in retaining as distinct genera *Ectocarpus*, Lyngb., *Pylaiella*, Bory, and *Streblonema*, Derbès. He also is of opinion that Magnus' genus *Ascocyclus* is generically distinct from Strömfelt's *Phycocelis*.

Three genera only, *Pleurocladia*, A. Braun, *Choristocarpus*, Zan., and *Discosporangium*, Falkbg., are included in the *Choristocarpaceæ*.

*Note on the genera* Entonema, *Reinsch*, *and* Streblonemopsis, *Valiante (Berichte der deutscher botanischer Gesellschaft*, IX., *No.* 5, *p.* 129-130, 1891.)

M. De Toni is of opinion, since *Entonema penetrans*, the type species of Reinsch's genus *Entonema*, a group undoubtedly containing plants belonging to more than one genus, is too closely related to *Streblonemopsis irritans*, Val. (1883), to be generically separated from it, that the latter genus must be united to *Entonema* (1875), a name having the priority of publication by some years.

*Parasitic Phæosporeæ.* (Journ. de Bot., Morot, VI., 1892, pp. 1-10, 36-44, 55-59, 76-80, 90-96, 97-106, 124-131. Four Plates.)

M. Sauvageau in this important paper calls attention to the fact that many of the smaller *Phæosporeæ* are true parasites, and not, as has too often been assumed, mere epiphytes. In the genus *Elachista*, *E. stellulata*, Griff., *E. Areschougii*, Crn., and *E. clandestina*, Crn., send endophytic filaments into the substance of the host-plant. The last named species, according to the author, appears to belong not to this genus, but rather to *Ectocarpus*, since it has no distinct basal layer. The author recalls attention to the fact that the following previously described Ectocarpi are also parasites, *E. investiens*, Hauck. ; *E.? velutinus*, Kütz. ; and *E. fasciculatus*, Harv., while he describes six species which are either entirely new or have never been described. Of these new species *E. minimus*, Näg. ; *E. brevis*, Sauv. ; and *E. parasiticus*, Sauv., have already been mentioned in this journal as occurring on the coasts of Britain ; it is, therefore, only necessary to mention the characteristics by which the remaining three species may be known.

*E. valiantii*, Born. in Herb.—This species is found on *Cystoseira ericoides*, its filaments penetrating the substance of the host plant to the depth of two or three cells, causing the formation of a gall-like growth ; endophytic threads composed of cylindrical, straight, or curved cells, 8-10 $\mu$ thick and from 1-4 times longer than broad, enlarged at the extremities or more or less torulose and irregular, branched in the gall in a corymbose manner.

the late Dr. Stroemfelt, growing on the fronds of *Chorda filum*. As the plants I gathered at Weymouth were thickly covered with sporangia, I am in hopes that the plant may prove to be not uncommon on our shores, its minute size having hitherto protected it from discovery.

**Chantransia trifila**, *Buffham, Journ. Quekett Microsc. Club, Vol.* v., *Ser.* ii., *p.* 24.

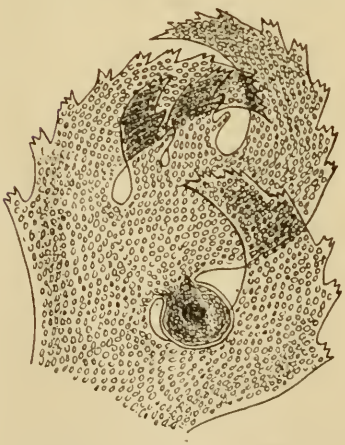
Swanage. On *Cladophora* (? *utriculosa*, Kütz.). Aug., 1890. T. H. Buffham.

This minute species, which Mr. Buffham considers is the smallest Floridean known, was found by him growing on an old specimen of a Cladophora, the fronds of which had, owing to the discharge of the zoospores, become hyaline, thus enabling the epiphyte to be studied with ease. The filaments arise, as in *Ch. (Acrochætium) microscopicum*, Næg., from a single basal cell, not as in the remaining species of the genus, from a monostromatic disc. From the basal cell arise three filaments in one plane, each filament consisting of three or four cells about 5 $\mu$ long and 4-5 $\mu$ in diameter. Sometimes the filaments terminate in a very thin hair. Monosporangia, 7·8 $\mu$ diam., spherical, terminal on 1-2 celled branches on the inner side of lateral primary filaments. Antheridia and cystocarps unknown.

**Plocamium biserratum**, *Dickie, Linn. Journal Bot.* xiv., *p.* 346.

Swanage. Sept., 1892.

Amongst some algæ gathered at Swanage, Dorsetshire, and communicated to us for identification by Miss Alridge, there was a specimen of this almost unknown species, which has, hitherto, been recorded from the Cape Verde Islands only. Porf. Dickie's account (*l.c.*) of the species is very short, and hardly sufficient, without a figure, for the identification of the plant, and had not his type specimens been preserved in the Herbarium of the British Museum, there might have been some doubt as to the identity of the British plant with the one from the Cape Verde Islands.



Portion of frond of *Plocamium biserratum*, Dickie, × 40.

The Swanage specimens, which exactly agree with the type specimens of *Pl. biserratum*, may be described as follows:— Fronds from 2-6 inches long, deep red, broadly linear, without a midrib; decompound pinnate, pinnæ alternate or in pairs, lanceolate

below, incurved above, the outer margins strongly biserrate, ultimate serrations thorn-like; conceptacles marginal, solitary, sessile; tetraspores zonate on decompound dichotomous processes with bifid apices.

The plant should be carefully sought for on the Southern Coasts of England and Ireland, where it may have been mistaken for a very broad form of *Pl. coccineum*. In general appearance the plant more resembles some of the species from Australia or the Cape of Good Hope than our only British species.

**Melobesia callithamnioides,** *Falkbg., Alg. Neap. p.* 265.

Weymouth. On *Ulva lactuca*. Sept.

Thallus very thin, adhering with the entire under-surface to the substance on which it grows, consisting of irregularly dichotomous, radiating, articulated threads 10-20 $\mu$ in diameter; filaments either remaining free and branching in an irregular dichotomous manner, often anastomosing, or united into flat fan-shaped or roundish expansions. Cells shorter than to one-and-a-half times as long as broad, with a very minute and indistinct cortical cell on the upper anterior margin of each. Besides the ordinary cells of the thallus, a second kind of cell, distinguished from the others by its larger size, convex apex, and the absence of the cortical cell, is present in this species. Conceptacles, large and numerous formed on the fan-shaped expansions.

This species forms a very indistinct pink stain on the surface of the host plant, and when growing on thick coarse algæ is very difficult to detect, but when on membranous translucent plants such as *Nitophylla* and *Ulvæ* it may at once, owing to the opaqueness of the chalk granules, be seen forming a dark patch on the fronds of the host plant. Hauck supposed that this species may be only a form of *Melobesia farinosa*, Lamour, but if so it is, in my opinion, a very distinct one. There can be little doubt that *Hapalidium callithamnioides*, Crouan, is identical with the present species, although, as Hauck points out, the figure in the " Florule du Finistère " is very incorrect.

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## Bibliography.

*A New Perforating Alga.*—MM. J. Huber and F. Jardin (Journ. Botanique, Morot, Aug., 1892) find on the shells of species of *Helix* and also on calcareous stones in clear rapid streams near Montpellier, a new fresh water perforating algæ, which they have called *Hyella fontana*. This new species, which is beautifully figured by the authors, agrees with *Hyella cæspitosa*, Born. et Flah., in its mode of growth, in the faculty it possesses of forming sporangia and of assuming the appearance of a chroococcaceous alga, but differs from it in possessing a non-septate sheath, each cell having a cell-wall, and the simplicity of the sporangia, which, in some respects, show an approach to the genus *Pleurocapsa*.

**Phæophila Engleri,** *Rke., Algenfl. der Westl. Ostsee. p.* 86.

Weymouth. On the shells of *Spirobis nautiloides* (on *Fucus serratus*).

Thallus as in the preceding species, but with filaments much more sinuous and slender. (In my specimens the cells are from 5-8 $\mu$ in diameter and from 10-80 $\mu$ long.)

This interesting species appears to the naked eye as a green stain on the shells of the *Spirobis*. When viewed as an opaque object under the microscope the creeping green fronds and the long colourless hairs are clearly visible, but it is only after the shell has been dissolved by means of acid that the plant can be accurately studied. MM. Bornet and Flahault, in their paper on the perforating algæ (Bulletin de la Soc. Bot. de France, vol. xxxvi.), state that a species of *Ochlochæte*, which appears to be Crouan's *O. dendroides*, v *calcicola*, Hansg., is frequently found mixed with *Gomontia* on various shells. We may expect this to occur on the coasts of Britain.

**Halicystis ovalis,** *Aresch., Phyc. Scand. p.* 221.

Loch Goil. G. Murray, Kyles of Bute, G. Murray, and Prof. Schmitz.

Mr. Geo. Murray and Professor F. Schmitz have been fortunate enough to discover, whilst dredging in the Clyde Sea-area, this most interesting alga, one of the most important that have been added to the British Marine Algal Flora for some years. This plant, originally described by Lyngbye under the name *Gastridium ovale* (Hydrophyt., p. 72, t. 18 A), has been placed by all subsequent writers, with the exception of Areschoug, in the genus *Valonia*, from which it differs in some not unimportant particulars, notably in the absence of pyrenoids. We are pleased to learn that Mr. Murray, in the forthcoming number of his "Phycological Memoirs," purposes to give an account of the structure and systematic position of *Halicystis*, for we trust that he will clear up many points, which at present are very doubtful, in this hitherto neglected genus.

**Ectocarpus brevis,** *Sauvageau, Journ. de Bot.* (*Morot.*), *Vol.* VI., *p.* 76, t. 2, *fig.* 11.

Berwick-on-Tweed. On *Ascophyllum nodosum*. October, 1891.

On examining some specimens of *Asc. nodosum*, gathered at Berwick in the autumn of last year, I found that they were covered with this very minute *Ectocarpus*, which has only lately been described by M. Sauvageau. When the fronds of the host-plant are wet the *Ectocarpus* is quite invisible, but when dry its presence is made known by its yellowish colour; but the filaments are so short that they can hardly be detected by the naked eye. The endophytic portion of the frond is well developed, formed of irregularly-branched filaments, the cells of which are from 6 to 12 $\mu$ in diameter, variable in form, and much longer than broad in the more deeply immersed portions, where they reach a length of 24 or 25 $\mu$, but short in the cortical portion of the host-plant. The

external filaments are very short, rigid, simple, obtuse, never prolonged into a hair, and sometimes slightly attenuated towards the base, where they immerge from between the cells of the host. Cells 8-10 $\mu$ in diameter, equal to or a little longer than broad. The external filaments composed of from 5-8 cells only. Plurilocular sporangia, oval or oval-lanceolate, 30-50 $\mu$ long, 15-20 $\mu$ broad, terminal, or more rarely becoming lateral owing to the continued growth of the filament below the sporangium. The plant forms yellowish brown patches, indeterminate in form on old fronds of *Ascophylla*.

**Ectocarpus parasiticus,** *Sauvageau, l.c. p.* 92, *t.* III., *fig.* 20-23.

Weymouth. In the fronds of *Ceramium rubrum* and *Cystoclonium purpurascens*. September, 1892.

Filaments in the early stage growing in the axis of the host-plant, ultimately forming more or less limited dark spots in the cortical layer, composed of many creeping and a few erect threads. Cells of the endophytic threads longer and narrower than those near the surface, varying from 8-30 $\mu$ long and from 2-10 $\mu$ broad. Chromatophores one in each cell, forming a parietal disc. Sporiferous threads unbranched, crowded in minute darker spots on the brown patch, forming clusters about 1 m.m. in diameter, composed of densely packed threads by which the cortical layer of the host-plant is sometimes ruptured. Some of the external threads are true hairs, long and colourless, growing by cell division at the base. Others, 6-8 $\mu$ in diameter and 60-90 $\mu$ long, are formed of cells 6-12 $\mu$ long, with larger chromatophores than the endophytic threads. Assimilation threads mostly terminated by a rounded cell, or sometimes prolonged into a hair. Plurilocular sporangia sessile, or on a pedicel composed of one or two cells, about 50 $\mu$ long and 9 or 10 $\mu$ broad. Divisions of the sporangia sometimes simple, sometimes divided into two longitudinally. Unilocular sporangia not observed.

**Microcoryne ocellata,** *Strömf., Notarisia,* 1888, *t.* 3.

Weymouth. On *Castagnea Griffithsiana*. September.

Fronds very minute, from 2-5 mm. high, simple and clavate or shortly forked, composed of a central axis of colourless filaments rather loosely united with a solid mass ; peripheral layer of short horizontal filaments packed in a gelatinous substance. Cells of the peripheral filaments 10-20 $\mu$ long and 5-8 $\mu$ broad, each containing four or five round chromatophores. Plurilocular sporangia formed by transformation of the peripheral filaments, cylindrical or spindle-shaped, 50-70 $\mu$ long and from 5-10 $\mu$ broad, crowded at the base of the unchanged filaments of the peripheral layer. Divisions of the sporangia simple at the base and apex of the sporangium, but longitudinally divided into two in the middle.

This very curious and interesting alga, which might be mistaken for very young plants of *Castagneæ* or *Mesogleæ*, had, previous to its discovery at Weymouth, only been recorded from the single locality on the coast of Norway, where it was discovered by

External vegetative filaments unbranched, terminating in a hair, not attenuated, 12-14 $\mu$ in diameter, the cells as long, or a little longer than the diameter. Sporiferous threads scarcely raised above the surface of the gall and terminating in a globular or oval plurilocular sporangium, which is, however, sometimes shortly stalked and attached laterally to the basal cells of the external vegetative filaments. Sporangia 50-53 $\mu$ long, and 30-35 $\mu$ broad, rarely 72 $\mu$ long, very numerous, completely covering the surface of the gall.

This minute species is about the size of *Myriactis pulvinata*, Kütz., from which, however, the obtuse, not attenuated vegetative threads and plurilocular sporangia readily distinguish it. Hab. Biarritz, discovered by Dr. Bornet in June, 1870.

*Ectocarpus luteolus*, Sauv.—This species forms a light yellowish down on the base of old stems of *Fucus serratus* and *F. vesiculosus*, of which the leafy part has fallen away, but of which the stems still live. The plant is not easily distinguished in the wet state, and should be looked for on a dry, sunny day. It does not occur on specimens of Fuci growing in the zone of *Ascophyllum nodosum*, but at a lower level in that of *Himanthalia*. The external portion of the plant forms an indefinitely extended cushion of branching threads, from which the erect filaments and those descending and penetrating the subjacent tissues originate. Erect filaments larger at the base than the summit, and terminating in a hair of one or several cells without chromatophores, very unequal in size, 6-8 $\mu$ at the base of the free portion, length sometimes 400 $\mu$, usually from 100-300 $\mu$, cells 1-3 times longer than broad, very indistinct. Plurilocular sporangia, terminating filaments arising from the base of the parasite or lateral on short branches of the longer threads, not very completely differentiated from the vegetative cells, 30-80 $\mu$ in length, 7-13 $\mu$ in diameter, often slightly torulose, chambers usually simple.

*Ectocarpus solitarius*, Sauv., a species found on *Dictyota dichotoma*, *Dictyopteris polypodioides*, and *Taonia atomaria*.—The endophytic portion small and irregular in shape, the external portion simple or slightly branched, bearing oval, plurilocular sporangia. [This species seems to be replaced on our shores by another closely allied species, which Mr. Holmes and I have recorded in our "Revised List" under the name *E. parvulus*, Kütz. Dr. Bornet, however, considers that it is distinct from that species.] These eight parasitic species of *Ectocarpus* appear to form a natural group, for which, perhaps, Thuret's name *Streblonema* might be adopted.

*The Muciferous Canals of the Laminariaceæ* (Ann. Sc. Nat. Bot., xv., 1892, pp. 1-46, 20 figs.)

M. L. Guignard, in a very interesting paper on the structure and development of the mucus canals of the *Laminariaceæ*, states that the tissues may be successfully fixed by a solution of chrome-alum and sea-water, and the mucilage then stained either with methyl-

violet, gentian-violet, or methyl-green acidulated with acetic-acid. After this treatment the canals can be studied with comparative ease. In the growing portion of the thallus situated at the base of the lamina and the apex of the stipe no canals are present. They first make their appearance in the form of lenticular cavities in the cells of the epidermal layer of the thallus immediately adjacent to that point. These cavities become pushed into the cortical tissue, and at their base small secreting cells are formed. The mucus cavities then put out anastomosing branches, which finally form a connected net-work stretching both into the stipe and lamina.

*On the Structure and Development of the* Chylocladieæ (Flora, LXXV., 1892, pp. 307-67, 2 Pls.).—Herr P. Hauptfleisch, in this rather elaborate paper, deals with the structure, development, and reproduction of the *Chylocladieæ*, a family containing only three genera, *Chylocladia*, *Champia*, and *Lomentaria*, all of which are very similar both in vegetative structure and reproductive organs. The distinguishing marks of the genera, as given by the author, are in *Lomentaria* the thallus is destitute of diaphragms, and the tetraspores occupy small cavities hollowed out in the cortex, while the fronds of the other two genera have cellular diaphragms and the tetraspores are scattered. As a further mark between *Champia* and *Chylocladia*, Herr Hauptfleisch mentions that the "lobes" of the cystocarps in the former are multicellular, while in the latter they are unicellular.

*Conjugation of Orthoneis binotata*, Grunow. (Journal of the Quekett Microscopical Club, Vol. v., ser. ii., July, 1892).

Mr. T. H. Buffham describes (*l.c.*) a very curious case of the conjugation of a diatom, the frustule of which is contained in a hyaline, gelatinous mass (for which the author proposes the name "periglœa") of hemispherical form with two long lateral horns ("tenaculoids"). The mode of conjugation is thus described: "A frustule which has completed, or almost reached, the stage of self-division, and is only 23 $\mu$ long, has a bulbous addition to the upper part of its periglœa, into which the double frustule rises. This speedily enlarges into a perfectly spherical sporangium of 75 $\mu$ diameter. The frustules occupy the centre of this, and then the lower one imparts its endochrome to the upper one. This upper frustule then divides and forms two masses of endochrome, which develop into two sporangial frustules of exactly double the length and width of the parent. One valve of the mother frustule is closely applied to the upper side of the upper sporangial frustule, and the other valve to the lower side of the lower frustule. The old lower frustule—which, perhaps, we must not call the male—is usually seen as two clear valves slightly separated and lying nearly vertically to its old position."

In connection with this account of the conjugation of *Orthoneis binotata* I may mention a curious fact. When examining some specimens of *Calothrix confervicola*, gathered many years ago at

Priority of specific names appears to be based entirely upon one section of the code of 1867. That simply says that when a species is transferred from one genus to another the specific name is maintained. This principle is usually understood and applied in the way that the oldest specific name has a right in all cases to be retained. It cannot fairly be so interpreted and applied, since it governs only to the extent that this should be the law, but it is not to be made an *ex post facto* law. This practice of retaining the oldest name *under the genus*, no matter what older specific names there may be, was adopted by Dr. Gray in his later years, and by the Kew botanists, for the reason that once established and pretty generally recognized, it would avoid the great mass of synonymy, which is being heaped like an incubus upon the science. I must express surprise that Dr. Britton has not considered it his duty to publish the last written words of Dr. Gray which were addressed to him upon this subject, and which expressed his positive opinions upon this point.

There is nothing whatever of an ethical character inherent in a name through any priority of publication or position which should render it morally obligatory upon anyone to accept one name rather than another ; otherwise it would be applicable or true as well in the case of ordinal names, morphological names, teratological, and every other form of name, to which now no one feels himself bound to apply the law of priority. The application of this law as at present practised by many botanists, which would make it the one great law of botanical nomenclature, before which every other must yield regardless even of common sense, is a mere form of fetichism exemplified in science. Many instances of the application of this law are not science, but are rather superstition.

## NOTES ON THE LIFE-HISTORY OF HYDRODICTYON.

*On the Reproduction of Hydrodictyon utriculatum. Georg Klebs.* (Flora, 1890).

*On the Formation of Reproductive Cells in Hydrodictyon utriculatum, Roth. Georg Klebs.* (Bot. Ztg., 1891, Nos. 48-52).

In the two articles enumerated the author has given some extremely important and interesting discoveries relating to the life-history of *Hydrodictyon*. The leading points are summarized under the following headings :—

*Alternation of generations.*—A fairly high temperature, plenty of light, and fresh water, containing inorganic salts in solution, favour the formation of asexual spores. These are also the conditions also most favourable for vegetative growth. A low temperature, subdued light, and stagnant water, containing organic substances, especially sugar, in solution, favour the formation of sexual spores. In whichever of the two conditions the organism is in at any given time the opposite condition can be brought about by a change of

environment, as indicated above, but the asexual mode of reproduction is more readily promoted than the sexual one.

*Period of reproduction.*—Zoospores and gametes are formed at all seasons of the year, providing the surroundings are favourable. Early in the morning is, as a rule, the time when the motile bodies escape from the mother cells, but there is no inherent, fixed law on this point, as zoospores are developed in darkness in a solution of maltose, and in the light in a sugary solution.

*Commencement of the formation of zoospores.*—The multiplication in the number of nuclei is the first indication of the formation of zoospores. Nevertheless, in cultures living in saline nutritive solutions this multiplication of nuclei takes place at the outset, and independent of the formation of zoospores, consequently when these are formed a new formation of nuclei is not necessary. Two or three times as many nuclei are usually present at first than can afterwards be detected, and this diminution in numbers is supposed to be due to fusion between themselves. At the commencement of the formation of zoospores the central portion of the protoplasm is broken up by numerous clefts, and finally becomes divided into numerous small polygons, separated by clear lines, and each containing a nucleus. The nucleus, at first central in each polygon, becomes peripheral, and forming a clear spot; at this point the two vacuoles and the two cilia of the zoospore are differentiated. The liberation of the zoospores is effected by the swelling of the cell-membrane, which finally becomes ruptured and disappears. The zoospores, freed from pressure, swarm for about an hour, and being held together by fine protoplasmic threads, retain their original position relative to each other. Finally they come to rest, become clothed with a cell-wall, and form a symmetrical net.

*Formation of gametes or conjugating motile bodies.*—The development of gametes agrees in the main with that of the asexual zoospores. The green layer of protoplasm contracts strongly, changes to a yellowish-brown colour, and forms a wide-meshed net, which eventually breaks up into polygons, as in the formation of zoospores, but the polygons are much smaller, and more completely separated from each other. The gametes are liberated by the rupture of the outer wall. During their escape they begin to swarm. The gametes are ovoid, contain a nucleus, two pulsating vacuoles, and two cilia. When free they conjugate in pairs.

## MUSCINEÆ.

*The Anatomy and Physiology of Mosses. R. Coesfeld.* (*Bot. Ztg.*, 1892, 1 Pl.)

The following parts are present in the stem of *Polytrichum commune*. A central bundle of elongated cells, representing a rudimentary vascular-bundle-system; the cell-walls of this portion alone give a pure cellulose reaction. A protecting sheath separates the central bundle from the cortical tissue. The cells of the cortical

completely with those distinctive characters that are unhesitatingly employed by all lichenologists. The colour of the apothecia, the spores, and the thallus are regarded as furnishing characters of great importance, and as these characters are derived from the presence or absence of colouring matters, why not arrive at the same systematic results from a study of the reactions of these same organs. In cases where varieties, species, or groups are distinguished by the colour of certain organs it might be attended with greater scientific precision by showing to what chemical substances these differences are due.

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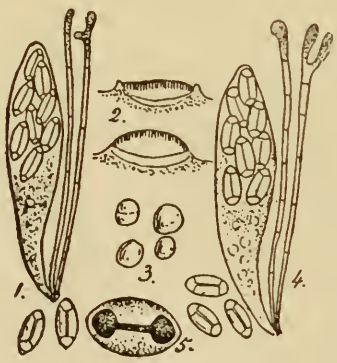
## New or Rare Lichens, by G. Massee.

**Lecanora Pollinii** (*Massal.*).=Blastenia Pollinii, *Massal. Syn. Lich. Blast.*, p. 15; *Massal. Mon. Lich. Blast.*, *p.* 111, *fig.* 27; Lecanora nigricans, *Tuck.* (*fide Nyl.*). Lecidea gibberosa, *Pollin* (*non Ach.*), *Flor. Ver.* III., p. 408.




*1-3 and 5, Lecanora Pollinii; 4, Lecanora ferruginea.*

Thallus thin, white when young, then greyish-white, glabrous, continuous or indistinctly cracked into areolae; hypothallus darker; hypothecia 1-2 m.m. across, scattered or crowded, circular or variously waved; at first brick-red with a brown tinge, plane, with a distinct margin, becoming blackish, convex, and immarginate; hypothecium dingy ochraceous; asci clavate, 8-spored; paraphyses slender, slightly incrassated at the apex, transversely septate; spores elliptical, ends rather acute, colourless; protoplasm occupying a subglobose cavity at each end of the spore, and connected by a delicate strand through the broad, median septum, 15-16 × 8-9 $\mu$; gonidia protococcoid, 7-11 $\mu$ diameter.

A specimen in the Leighton Herbarium at Kew. Collected in Yorkshire.

Considered by some continental botanists as a variety of *Lecanora ferruginea* (Huds.), Nyl., but raised to specific rank by Massalonga, and distinguished from *L. ferruginea* by the brownish brick-red apothecia becoming very convex, immarginate, and blackish with age, the distinct ochraceous hypothallus, and the broader and more pointed spores. The hymenium becomes purple or crimson with Kho, due to the solubility of the pigment in the tips of the paraphyses. The asci become deep blue with I.

Fig 1, *Lecanora Pollinii*, ascus with spores, two paraphyses, and two free spores, × 400; fig. 2, sections through apothecia at

different ages, × 50; fig. 3, gonidia of same, × 400.—Fig. 4, *Lecanora ferruginea*, ascus with spores, two paraphyses, and two free spores, × 400. Fig. 5, spore of *L. Pollinii*, showing the two small loculi of the spore separated by a very broad median septum, through which a central strand of protoplasm extends from one cavity to the other; highly ×.

*Odontotrema longuis*, Nyl., is synonymous with *Patellaria proxima*, Berk., hence the species will stand as *Odontotrema proxima* (Berk.).

*Parmelia molliuscula*, Ach.—T. A. Williams ("Missouri Botanical Garden; Third Annual Report," 1892) adds to the knowledge of this lichen by giving an account of the fructification, which, although a cosmopolitan species, has hitherto occurred only in a sterile condition. While looking over the Engelmann Herbarium at the Missouri Botanical Gardens a couple of fragments of this species, from Upper Pole Creek, in the Black Hills region, U.S., were found bearing several apothecia, which are as follows:—"Apothecia middling size; disc dark chestnut brown, becoming flattish; margin often at first entire, but soon becoming subcrenulate." What the "middling" size of the apothecia is relative to is not stated. Spores were not seen in the asci, but a few loose ones were seen; they were simple, colourless, ellipsoid, and measured 10 × 5 $\mu$. In the beautiful plate accompanying the note the apothecia appear substipitate, asci broadly cylindrico-clavate and shorter than the stout, clavate paraphyses.

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## ON NOMENCLATURE.

Sereno Watson. (*Bot. Gaz.*, 1892, *p.* 169.)

We heartily endorse the following remarks on a subject which, in the hands of certain men at the present day, "is being heaped like an incubus upon the science" of botany.

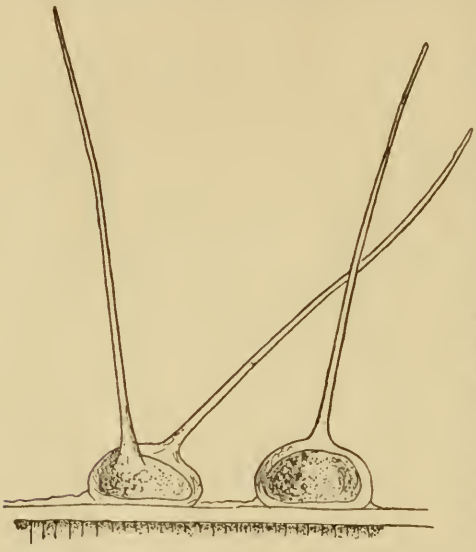
[It was the request of the late Dr. Sereno Watson that the following communication dictated by him in his last illness should appear at an early date in the "Botanical Gazette."—Eds.]

For some time I have had a desire to give expression to my views upon botanical nomenclature. Under the circumstances, I must speak briefly and somewhat dogmatically. In my opinion botany is the science of plants, and not the science of names. Nomenclature is only one of those tools which is necessary to botany, and this being the case, points of nomenclature should be subordinated to science.

A principle of botanical convenience has been established by those who prefer one name to another on account of expediency or convenience. This principle should have a great deal of influence. It has been so recognized by the greatest botanists, and from their authority receives great weight. I prefer the word *expediency* as a better term than convenience to designate the principle, that the demands of science override any merely technical claims of priority, etc.

Bognor and now preserved in the Herbarium of the British Museum, I was surprised to find them thickly covered with the curious bodies a sketch of which is given below:—

So closely did these bodies resemble *Olpidia* that had not they been filled with a grumous green matter, I should unhesitatingly have referred them to that genus. On the appearance of Mr. Buffham's paper I was struck by the close resemblance these bodies bore to figure 10 of his Plate. I also found that they agreed very well with the measurements given by him. I consequently re-examined a number of specimens, with the result that in one or two of them I distinctly saw the two diatoms as figured by Mr. Buffham. I am, therefore, forced to the conclusion that these Olpidium-like bodies are nothing more than the empty periglœa of *Orthoneis binotata*, and I have little doubt that they have often been mistaken for true *Olpidia*.



Empty periglœa of *Orthoneis binotata*, Grunow, × 300.

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## LICHENS.

### Wainio on Lichens.

(*Continued from p.* 32.)

*Pseudostroma of Lichens.*—The genera *Glyphis* (Ach.), *Chiodecton* (Ach.), and *Trypethelium* (Spreng.), established by old authors on account of the stroma-like appearance of the excipulum, are not kept up by Wainio as autonomous genera for the following reasons:—Their anomalous stroma, called by Wainio a pseudostroma, results from the adherence of the perithecia of agglomerated apothecia protruding from the thallus, as in *Glyphis*, *Leptoraphis*, sub-gen. *Tomasiella* (Mass.), *Arthopyrenia*, etc. In other instances the pseudostroma is formed from a combination of the perithecia (excipulum proper) and the amphithecia (thalloid excipulum). Their appearance in general depends simply on the coincidence of the prominence and the simultaneous adherence of the apothecia.

In a great number of species the author has met with, on the same specimen, some of the apothecia adhering and forming a pseudostroma, or, more or less, clustered, whereas others were completely free and isolated. With regard to such species it is stated that some have been placed in genera characterized by a pseudostroma, others in genera distinguished by isolated apothecia even by the same author.

Such intermediate forms are very numerous, as in *Graphis*, *Glyphis*, etc. In the genus *Pertusaria* transitions between simple and compound apothecia occur; on the other hand, confluent apothecia are shown to occur in genera *Lecidea*, *Lecanora*, and *Buellia*.

In the last named the transition is so evident that no author would suggest a division of these genera on the basis of simple and grouped apothecia.

*Groups characterized by the paraphyses.*—Many natural genera are met with in the Pyrenolichens and the Graphideæ that are distinguished from each other by characters afforded by the paraphyses in conjunction with those afforded by the spores. Branched and connected paraphyses occur in the following genera of the Pyrenolichens:—*Aspidopyrenium*, *Heufleria*, *Astrothelium*, *Campylothelium*, *Pseudopyrenula*, *Leptoraphis*, *Microthelia*, *Arthopyrenia*, *Haploprenula*. On the contrary the paraphyses are simple or not connected in *Aspidothelium*, *Pornia*, and *Strigula*, and variable in *Bottaria*, *Pyrenula*, and *Thelenella*. Among the Graphideæ they are branched and connected in *Opegrapha*, *Helminthocarpon*, *Chiodecton*, and *Arthonia*, simple or not connected in *Acantothecium*, *Graphis*, and *Melaspilea*. In the Pertusarieæ they are also branched and connected. In the higher groups the paraphyses are, in general, simple or variable, and in the latter case are altogether insufficient for characterizing even the minor groups. Especially in the genus *Parmelia* it may be seen that amongst allied species some have the paraphyses simple or free from each other, whereas in others they are connected or anastomose. In *Lecidea versicolor* (Fée), *L. micrococca* (Kœrb.), Myl., etc., the paraphyses are branched and connected, whereas in most of the members belonging to the same groups as the above they are simple. Again, in *Lecanora symmictella* (Wainio), belonging to the *Eulecanora* (Th. Fr.), also some belonging to the sub-genera *Lecania* (Mass.), Wainio, and the species belonging to *Calenia* (Müll. Arg.), the paraphyses are branched and connected, whereas in the remainder of the species of *Lecanora* they are simple. As most of the species enumerated are closely allied to species with simple paraphyses, this character would not appear to be sufficient for groups in these genera.

The genus *Ochrolechia* is characterized, in addition to the spores, by branched paraphyses that are not connected.

*Chemical characters.*—Although many authors protest strongly against the value of chemical diagnoses for the determination and classification of Lichens, nevertheless these very frequently coincide

portion are distinguished from those of the central bundle by being much shorter, resembling bast-cells in shape, and in not giving a distinct cellulose reaction ; these cells are connected by pits, which are well shown in *P. juniperinum*, but as a rule can only be clearly seen when stained. The epidermis consists at first of a single layer of cells ; later on these divide tangentially, forming more layers.

There is no evidence of lignification in any of the tissues.

The function of the central bundle is much more that of conducting food material than of water. It also serves as a receptacle for store food, the cells containing oil and starch-grains in the spring. The cells of the cortical tissue contain tannin, especially in the spring.

The following notes by *F. Stephani*, in *Journ. Linn. Soc.*, Vol. xxix, may be of value to those interested in the study of the Hepaticæ.

In all *Frullaniæ* the leaf-lobule (auricle) is folded in if the plants grow in a dry atmosphere, and is unrolled or reduced in size and form if they grow in wet and misty localities. This may be observed also in our European species. The leaf-lobule is a water-sac, which is well developed in dry localities, and becomes useless in a damp atmosphere.

The stylus (at the postical insertion of the leaf-lobule), which can be found, with very rare exceptions, in every *Frullania*, and may be traced also in the female bracts as a more or less conspicuous tooth or lacinia at the base of the postical margin, is sometimes developed into a large lanceolate leaf overlying the cucullate auricle or leaf-lobule. This variability leads to the conclusion that the said stylus is nothing but a reduced lacinia of the leaf-lobule. I have the authority of Dr. Spruce in support of this view (see *Trans. Bot. Soc.*, Edinb., xv., 1884, p. 3). The stylus springs from the base of the lobule, just as in *Cololejeunea*, the only difference being that in the last it is free ; in *Frullania*, however, more or less *connate* to the leaf-lobule. In both the stylus is certainly part of the leaf, and stands in no relation whatever to the stipules. Mr. Pearson, in his paper on Canadian *Hepaticæ*, has given expression to the opinion that in *Cololejeunea* the stylus is the remnant of a normally bifid stipule. I may be allowed to differ from this view. *Cololejeunea*, though having no stipules, produces radicles on exactly the same places wherein other *Lejeuneæ* stipules are found ; in *Cololejeunea* the latter have disappeared. The rootlets, which always spring from the base of the stipules in *Lejeunea*, alone remain, and point out the place where stipules once stood. This place, however, is as far away from the stylus folii in *Cololejeunea* as stipules are in *Frullania*, and no relation between the two organs can be established. Certainly an organ cannot be called a remnant of another if they do not spring both from the same root.

*Hepaticæ Africanæ.*—F. Stephani continues to describe and figure new species. The present batch of novelties are from the Mascarenes and Madagascar (*Hedwigia*, p. 198, pl. xix-xxi, Heft. 5, 1892).

No. 99. March, 1893.

# Grevillea.

A QUARTERLY RECORD OF CRYPTOGAMIC BOTANY AND ITS LITERATURE.

## FUNGI.

### Fungilli novi Europaei et Asiatici.

Auctore P. A. Saccardo.*

**1. Calosphæria polyblasta,** *Rommel et Sacc.*

Peritheciis in acervulos minutos ternis—senis aggregatis v. subsparsis, sub peridermio adhærente v. relaxato nidulantibus, globulosis, ½-¾ m.m. diam., glabris, demum basi concavo-collabentibus, nigris, intus nitidulis; ostiolis brevicollibus, acutulis, integris, peridermium perforantibus vix excedentibus; ascis clavatis, deorsum tenuato-stipitatis, 42-50 × 9-10, apice obtusulis, 8-sporis, paraphysibus filiformibus asco longioribus; sporidiis in asci parte superiore conglobato-distichis, cylindraceis, curvatis, utrinque rotundatis, 5-cuboideo-nucleatis, simulateque 4-septatis, non constrictis, 12-22 plerumque 15 × 3, hyalinis.

Hab. In ramulis siccis *Salicis capreæ*, ad Stockholm Sueciæ, Julio, 1891 (Lars Romell), *A. Cal. vasculosa* affinibusque præcipue sporidiis pseudoseptatis, longis recedit.

**2. Diaporthe (Euporthe) hypospilina,** *Sacc. et Flag.*

Peritheciis singulis v. paucis hinc inde in folii parenchymate immersis, linea nigra subcirculari cinctis, epidermideque (præcipue inferiori) leniter atrata tectis, globulosis, ½ m.m. diam., ostiolo conoideo brevissimo epidermidem vix excedente; ascis fusoideis, subsessilibus, 40-50 × 7-8, octosporis, aparaphysatis, lumine apice bifoveolato; sporidiis distichis, fusoideis, 1-septatis, vix constrictis, 12-14 × 3, indistincte guttatis, hyalinis.

Hab. In foliis dejectis *Mahoniæ Aquifolii*, Rigny Galliæ (Flageolet). *D. ceuthosporioidi* affinis sed maculæ stromaticæ minores (1-2 m.m. diam.), nec rufæ, etc. *Hypsopilam* imitatur.

* Describuntur species nonnullæ missæ, a cll. *Lars Romell* (Stockholm), ab. J. *Flageolet* (Rigny-sur-Arroux), *P. Brunaud* (Saintes), *N. Paltschewsky*, curante *N. Busch* (Kazan), *F. Eichelbaum* (Hamburg), *Krieger*, curante *Bresadola* (Trento)

**3. Diaporthe (Euporthe) maculans,** *Sacc. et Flag.*
Peritheciis singulis v. paucis in areolis elongatis, minutis, sub epidermide nigrificata innato-prominulis, globosis, nigris, $\frac{1}{4}$ m.m. diam., ostiolis minutissimis; ascis fusoideis, 40-48 × 7-8, aparaphysatis, 8-sporis, apice bifoveolatis; sporidiis distichis tereti-fusoideis, 1-septatis, constrictis, 4-guttatis, 15 × 4, hyalinis.

Hab. In ramis emortuis *Berberidis vulgaris*, Rigny (Flageolet). Maculis elongatis, 2-3 m.m. long, $\frac{1}{2}$ m.m. lat., a præcedente præcipue differt, sed utraque forte varietas *D. ceuthosporioidis*.

**4. Melanopsamma obtusella,** *Sacc.*
Peritheciis sparsis, globoso-depressis, basi insculpta subsuperficialibus, $\frac{1}{3}$-$\frac{1}{2}$ m.m. diam., carbonaceis, nigris, levibus, ostiolo minuto impresso obtuso; ascis cylindricis, brevissime stipitatis, apice rotundatis, 100-120 × 8; paraphysibus filiformibus; sporidiis oblique monostichis, obovato-oblongis, utrinque acutiusculis, constrictulo-1-septatis, 17-18 × 6, e hyalino dilutissime luteolis.

Hab. In ramis decorticatis putrescentibus, *Rhamni Frangulæ*, Rigny Galliæ (Flageolet). Ab affini *M. obtusa*, Karst. differt ascis cylindricis angustioribus, sporidiis supra latioribus, peritheciis minus emergentibus, matrice, etc. Socium adest *Lophiostoma dumeti*, Sacc.

**5. Delitschia geminispora,** *Sacc. et Flag.*
Peritheciis hinc inde gregariis, basi adnata superficialibus globoso-papillatis nigris, $\frac{1}{6}$-$\frac{1}{5}$ m.m. diam., glabris, carbonaceis, ostiolo rotundo exiguo pertusis; ascis tereti-clavatis, 150-160 × 30, brevissime stipitatis, apice rotundatis, bisporis; paraphysibus filiformibus, copiosis; sporidiis ellipsoideis, constricto-1-septatis, 50-60 × 30, grosse bi-guttatis, fuligineis, loculis obtuse conoideis, subinde tandem secedentibus.

Hab. In fragmentis ligneis *quercinis* putridis (an stercoratis), Rigny Galliæ (Flageolet). Eximia et distincta species.

**6. Metasphæria orthospora,** *Sacc.*
Peritheciis gregariis, globoso-depressis, epidermide velatis, prominulis, ostiolo minuto obtuso vix erumpentibus, $\frac{1}{3}$ m.m. diam., ascis cylindraceis, breve stipitatis, apice rotundatis, 130-140 × 15, octosporis; paraphysibus filiformibus copiosis; sporidiis distichis cylindraceis, rectis, utrinque rotundatis, sed sæpius etiam brevissime et obtuse papillatis, 21 × 5, triseptatis, levissime constrictis, hyalinis.

Hab. In ramulis corticatis nitidis *salicinis*, Rigny Galliæ (Flageolet). Affinis *M. cinereæ* et *depressæ*.

**7. Massaria Flageoletiana,** *Sacc.*
Peritheciis laxe gregariis, globosis, crassiusculis, subcoriaceis, atris, $\frac{3}{4}$ m.m. diam., peridermio colliculoso tectis, ostiolo minuto obtuso vix erumpente; ascis tereti-clavatis, 180 × 30, brevissime crasse stipitatis apice rotundatis, 6-8-sporis; paraphysibus fili-

formibus, guttulatis; sporidiis distichis, fusoideis, utrinque obtusulis, rectis v. leniter curvis, crasse globoso-6-guttatis, prope medium distincte 3-septatis, non constrictis, hyalinis, guttis subinde ocellatis.

Hab. In ramis corticatis emortuis *Viburni Opuli*, Saone et Loire Galliæ (Flageolet). Eximia et distincta species.

**8. Micropeltis Flageoletii**, *Sacc.*

Mycelio filiformi repente tenuissimo pallido; peritheciis sparsis amphigenis, dimidiatis, scutiformibus, nigris, 300 $\mu$ diam., subastomis contextu radiatim celluloso, margine fimbriato; ascis fasciculatis, fusoideis, utrinque obtusulis, octosporis, aparaphysatis, 50-60 × 14-16; sporidiis fusoideis sæpe curvulis, utrinque obtusulis, constrictulo-3-septatis, 18-21 × 5-6, hyalinis.

Hab. Un foliis vivis *Hederæ Helicis* et *Ilicis Aquifolii*, Rigny Galliæ (Flageolet).

**9. Phoma arenaria**, *Sau.*

Peritheciis gregariis, seriatis, globosis, innatis, 100 $\mu$ diam., epidermide diaphana velatis, poro pertusis; sporulis fusoideis, rectis, apice obtusioribus, 20-22 × 4-5, guttulato-nubilosis, hyalinis; basidiis paliformibus, obtusulis, 8-10 × 3, hyalinis.

Hab. In foliis emortuis *Caricis arenariæ*, Saintes Galliæ (Brunaud).

**10. Ascochyta arophila**, *Sacc.*

Maculis oblongis arescendo dealbatis, fusco-marginatis, 2-3 c.m. long; peritheciis gregariis amphigenis, lenticularibus, atris, pertusis, 100-110 $\mu$ diam.; sporulis ellipsoideo-oblongis, 1-septatis, constrictulis, 2-guttulatis, 18-21 × 5-6, chlorino-hyalinis.

Hab. In foliis languidis *Ari maculati* v. *Italici*, pr. Rigny Galliæ (Flageolet). Affinis *A. Iridis* et *A. Erythronii*.

**11. Rhabdospora eupyrenoides**, *Sacc.*

Peritheciis hinc inde densiuscule gregariis, majusculis, e globoso acute papillatis, nigris, duriusculis, vix $\frac{1}{2}$ m.m. diam., subcutaneis, mox cute secedente superficialibus; sporulis longe bacillaribus, utrinque acutulis, sæpe curvis, 90-100 × 3, 20-30-guttulatis, hyalinis.

Hab. In caule emortuo *Euphrasiæ*, pr. Rigny Galliæ (Flageolet). Affinis *R. cupyrenæ*.

**12. Leptostromella cladopoda**, *Sau.*

Peritheciis laxe seriatis, subsuperficialibus, elongatis, convexulis, opace nigris, 0·5-0·7 mm. long., 0·2 mm. lat., rima tenui percursis; sporulis anguste fusoideis, rectis, curvulisve, 20-22 × 3, nubilosis, hyalinis; basidiis bacillaribus, 15-20 × 2-4, plerumque ex ima basi furcatis, raro varie ramosis, dilute melleis, coacervatis subfuligineis.

Hab. In foliis emortuis *Typhæ angustifoliæ*, Saintes (Brunaud). *A Lept. hysterioide* β *graminicola* differt præcipue sporulis paullo

crassioribus et basidiis distincte fuscato-ramosis, coloratis; a *Lept. nitido* (cujus sporulæ sunt ignotæ) recedit peritheciis opacis nec insidis.

**13. Dimerasporium strigosum** (*Fr. pp. Lib.*), Sacc. Syll., III., p. 683, Sec. ill. De Not. in Mem. Accad. Tor. X., p. 168, hæc species est *Excipula strigosa*, β *hysteriformis*, Fr., S. M., II., p. 103 (= *Vermicularia strigosa*, Lib., *Excipula strigosa*, Corda = *Exc. hysteriiformis*, De Not. l.c.), dum *Dimerasp. graminum* (Lib.) Lév., Sacc. Syll., l.c. est typus *Excipulæ strigosæ*, Fr., l.c. (= *Vermicularia graminum*, Lib. = *Exc. graminum*, Corda= *Exc. strigosa*, D. Not., l.c.).—*Amerosporium hysteriiforme*, Pass. in litt. et Sacc. Syll. X., p. 437. *Excipula hysteriiformis* (De Not.), Pass. in Erb. critt. ital. I., n. 1478, ob sporulas 18 × 3 (senio muticas), et locum in lignis mihi videtur status senex *Dinem. hispiduli.*

**14. Glæosporium nævioides,** *Romell et Sacc.*

Maculis irregularibus confluendo ampliatis griseo-isabellinis, indistincte obscuriorins marginatis; acervulis disciformibus, brunneo-nigricantibus, 125-180 μ diam., erumpentibus basi stromatica crassa rufo-fuliginea perithecioidea suffultis; conidiis ex ovato oblongis utrinque præcipue apice rotundatis, continuis, intus granulosis, hyalinis, 30-35 × 10-12, basidio cylindraceo breviori fultis.

Hab. In foliis languidis *Populi tremulæ*, pr. Stockholm Sueciæ (Romell).

**15. Pestalozzia (Monochætia) brachypoda,** *Sacc.*

Acervulis punctiformibus, gregariis, nigris, in arcolis albidis (entomogenis?) foliorum sitis; conidiis fusoideis, sæpe inæquilateris, 3-septatis, non constrictis, 18 × 5, loculis binis interioribus olivaceis, extremis hyalinis, setula unica stipiteque filiformibus hyalinis, 7-8 × 1 æquilongis.

Hab. In foliis adhuc vivis *Viburni* (*Opuli?*), in Ussuria Australi Sibir. orient. (*N. Paltschewsky*), communicavit *N. Busch.*

**16. Coryneum anceps,** *Sacc.*

Maculis brunneo-rufis, irregularibus, centro saturatioribus; acervulis punctiformibus, nigris, erumpentibus, gregariis; conidiis ellipsoideo-oblongis, inæquilateris, 5-6-septatis, 24-26 × 8, olivaceo-fuligineis, ad septa leniter constrictis, loculis extremis exiguis, hyalinis, superiori plerumque curvo rostriformi, 3-4 × 0·6; stipite filiformi, hyalino, 30-40 × 1, subinde binis basi junctis.

Hab. In foliis languidis *Euonymi alati* in Ussuria Australi Sibiriæ orient. (*N. Paltschewsky*), commun. *N. Busch.* Subaffine *Coryneo intermedio*, Sacc.

**17. Ovularia Sommeri** (*Eichelbaum*), *Sacc.*=? Sphæria Sommeri, *Eich., Bot. Centralb.*, 1887, I., *p.* 378.

Cæspitulis dense gregariis, albidis, ex basi stromatica, cellulari pulvinata, erumpente, oriundis; hyphis simplicibus, subcontinuis, fasciculatis, filiformibus, sursum obtuse denticulatis, 50-60 × 4, conidiis obovatis, continuis, basi subapiculatis, 18 × 9.

Hab. In apice ramulorum juniorum *Myricæ gales*. Eppendorfer Moor, pr. Hamburg, Majo, 1884 (*F. Eichelbaum*). Cæspituli, confluendo, ramulos late per 3-4 c.m. ambiunt et mox necant. Versimiliter, ut cl. Eichelbaum censet, species sistit statum conidicum cujusdam Sphæriaceæ.

**18. Torula (?) maculicola,** *Romell et Sacc.*

Maculis amphigenis, tuberculariibus nigricantibus, 2-3 m.m. dicum., centro pallidioribus ; cæspitulis in centro maculæ gregariis, sæpe hypophyllis, olivaceo-atris ; hyphis conidiophoris brevissimis, olivaceis, cylindraceis, 7-8 × 3, e basi stromatica cellulosa oriundis ; conidiis ellipsoideo-oblongis v. fusoideis, 14-25 × 4-6, olivaceis, paucis catenulatim junctis, extremis minutis.

Hab. In foliis vivis *Populi tremulæ*, pr. Stockholm Sueciæ, 1890 et 1891 (*Romell*). Cum *Fusicladio* et cum *Cladosp. asteromate* quandam habet affinitatem.

**19. Fusoma biseptatum,** *Sacc.*

Maculis elongatis, isabellinis ; acervulis exiguis, depressis, compactinsculis, pallidis, subsuperficialibus ; conidiis fusoideis, leniter curvis, apice acutioribus, 2-septatis, minute guttulatis, hyalinis, 20-30 × 4 ; basidiis ovato-conoideis, inæqualibus, 12 × 4, parallele stipatis, ex hyphis tortuosis enatis.

Hab. In foliis languidis *Calamagrostidis* spec. Nossen Saxoniæ (*Krieger.*).

## Explicatio Tab. 184.

1. *Calosphæria polyblasta.* 2. *Diaporthe hypospilina.* 3. *Diaporthe maculans.* 4. *Melanopsamma obtusella.* 5. *Delitschia geminispora.* 6. *Massarina Flageoletiana.* 7. *Metasphæria orthospora.* 8. *Micropeltis Flageoletii.* 9. *Rhabdospora eupyrenoides.* 10. *Ascochyta arophila.* 11. *Glœosporium nœvioides.* 12. *Pestalozzia brachypoda.* 13. *Coryneum anceps.* 14. *Ovularia Summeri.* 15. *Fusoma biseptatum.* 16. *Torula (?) maculicola.*

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# NEW BRITISH FUNGI.

By M. C. Cooke.

**Coprinus volvaceo-minimus,** *Crossland Nat., No.* 209, *p.* 372.

Pileus 3 lines broad, ovate, then campanulate, grey, inclining to cinereous, disc darker, sprinkled with white squamules, membranaceous, striate, margin splitting and reflexed when old ; gills almost free, narrow, attenuated at each end, becoming blackish-purple ; stem $\frac{3}{4}$-1 in. long, less than a line thick, apex slightly swollen, fistulose, glabrous, hyaline, furnished at the bulbous base with a distinct, sheathing, persistent ring or collar, about half

width of pileus, and which becomes reflexed; spores blackish-purple, subglobose, minutely apiculate, 6-7 $\mu$.

On manure heap. Wellhead, Halifax.

Readily distinguished from *C. Hendersonii* by the ovate pileus, distinct basal volva, with free, persistent, collar-like margin, and smaller subglobose spores.

**Hydnum fuligineo-album,** *Schmidt. Myc. Heft.*, I., *p.* 88.

Pileus about 3 in. across, flesh thick, firm, white, and like that of the stem, becoming reddish-brown when cut; expanded, wavy, or often excentric, rather silky, scaly at the disc, whitish, scales darker, with faint tinge of pink near the margin; stem about $1\frac{1}{2}$ in. long, up to $\frac{3}{4}$ in. thick, solid, whitish, with rudimentary squamules; spines crowded, subulate or compressed, about $\frac{1}{4}$ in. long, white, then pale reddish-yellow; spores globose, 5-6 $\mu$ diam.

On the ground. Halifax. (C. Crossland.)

A fine species, distinguished by the white flesh becoming reddish when broken. Taste pleasant, smell none. Agreeing exactly with the description given by Schmidt, but differing widely from the figure by Fries, Icon. t. 3, upper Figs.

**Phoma pinastrella,** *Sacc. Syll., No.* 598.

Perithecia gregarious, but always simple and never confluent, semiglobose or rather conoid, prominent or semi-immersed, quite black, girt by regularly ruptured cuticle; sporules ellipsoid, mostly straight, a little attenuated to each end, but rounded, for the most part biguttulate, hyaline, 4-5 × 2-$2\frac{1}{2}$ $\mu$, very numerous.

On fir leaves. Carlisle.

**Geopyxis majalis,** *Fries Nova Symb.*, 120.

Wax coloured, urceolate campanulate, regular, externally almost naked, of the same colour; stem short, white; margin rather prominent, flocculosely crenate; disc orange, asci cylindrical; sporidia narrowly elliptical, smooth, hyaline, 15 × 6 $\mu$.—*Sacc. Syll. No.* 247.

On the ground. Scotland.

Cups 6-8 m.m. broad.

**Lachnea (Scutellinia) erinacea,** *Schwein. Syn. Car.*, 1194.

Gregarious, orbicular, depressed, ochraceous-white, externally clad with long brown setulose hairs. Asci cylindrical, octosporous; sporidia elliptical, nucleate, smooth, 18-20 × 10-11 $\mu$; paraphyses clavate at the tips.—*Sacc. Syll. No.* 741.

On rotten wood. Carlisle.

Cups 2-4 m.m. broad. Hairs brown, almost continuous; 250 $\mu$ long.

**Neottiella ovilla,** *Peck* 28 *Rep., p.* 66.

Minute, at the beginning nearly closed, subglobose, then cup-shaped, open, rather firm, minutely whitish tomentose, disc rubescent, asci cylindrical, sporidia fusoid, 1-2 guttulate, 30-40 $\mu$ long.

On the ground. Cups 3-5 m.m. diam.

var. **flavodisca**, *Cke. & Mass.*

At first rather top shaped, from the presence of a short obconical stem, disc yellow, sporidia 40-45 × 17-20 $\mu$, uniguttulate, paraphyses clavate at the tips. External hairs septate, smooth, 150 $\mu$ long, 6 $\mu$ thick.

On the ground, among moss. Ben Lawers, 2,500 feet.

**Trichopeziza nidulus**, *Schm. & Kze.*; var. **macrospora**, *Cke. & Mass.*

Cups as in the type, sporidia rather fusoid, rounded at the ends, 12-14 × 4 $\mu$.

On *Spiraea ulmaria*. Carlisle.

Various measurements are given by authors of the sporidia of *T. nidulus*, from 5 × 1 $\mu$ in Rehm's specimens, 4 × 2 $\mu$ of Fuckel, to 6-10 × 1½ $\mu$ of Nylander, 5-10 × 1 $\mu$ of Phillips, and 8-12 × 1-1½ $\mu$ of Saccardo. None of these have sporidia so long or so broad as the above variety, which is of sufficient importance to claim notice as a very distinct form.

**Pseudohelotium farinaceum**, *Cke. & Mass.*

Gregarious, thin, waxy, rather tough. Cups sessile or subsessile, yellowish horn colour, at first hemispherical, then expanded, covered externally with pruinose white mealiness, attached by a papillate central point to the matrix, margin entire, flexuous, strongly connivent when dry; disc glaucous or dirty white, asci cylindrical, octosporous, sporidia cylindrical, straight, hyaline, minute, 4 × 1 $\mu$, paraphyses filiform.

On bark of willow. Carlisle.

Cups 1-2 m.m. broad, stem very short or obsolete.

**Masseea quisquiliarum**, *B. & C.*

Yellow, cup-shaped, sessile, margin inflexed, disc concave, reddish yellow, asci clavate, octosporous, sporidia fusiform, curved, triseptate, 25 × 6-7 $\mu$, hyaline, even, paraphyses filiform.

**Peziza quisquiliarum**, *Berk. & Curt., Cuba Fungi, No.* 670, *Cooke, Myco., f.* 37, *Sacc., No.* 2017.

On vegetable *débris*. Carlisle.

Cups 2-5 m.m. broad. Exactly like the original specimens from Cuba.

**Belonium myriadeum**, *Cke. & Mass.*

Densely gregarious, cups minute, sooty black, scarcely ¼ m.m. broad, urceolate, at first nearly closed, then concave when moist, connivent when dry, smooth at the margin and paler, towards the base furnished with long, branching, dark brown septate hairs, which radiate and form a dense blackish subiculum, asci clavate, cylindrical, sporidia fusiform, acute at each end, straight or curved, nucleate, then triseptate, 25-30 × 4-5 $\mu$, hyaline, paraphyses filiform.

On branches of *Ulex*. Carlisle.

The byssoid subiculum extends for two or three inches, on which are crowded myriads of minute cups, the whole black to the naked eye, dotted with small rings, which indicate the paler mouths of the cups. An elegant species, reminding one of *Tapesia fusca*, but much smaller.

**Ascobolus asininus**, *Cke. & Mass.*

Scattered or gregarious, hemispherical or sub-depressed, watery, fleshy, at first umbilicate, then open, with a thick margin, indistinctly rugulose, pale olive green or amber, or a combination of both. Asci broadly clavate, octosporous, sporidia elliptical, at first colourless, at length reddish brown, epispore thick, finally minutely cracked into subhexagonal minute areolæ, paraphyses very long, filiform, flexuous, much longer than the asci.

On asses' dung. Kew.

Cups 1-2 m.m. diam., asci 160-170 × 45-50 $\mu$, sporidia 40-45 × 21-23 $\mu$.

**Cenangium acicolum**, *Fckl.*

Gregarious, erumpent, top shaped, very shortly and thickly stipitate, externally yellow-brown, smooth, when dry mealy and convolute, between waxy and leathery, disc nearly plane, of the same colour, with a paler margin, asci clavate, octosporous, sporidia ellipsoid, straight, continuous, hyaline 12-14 × 3½-4 $\mu$, paraphyses filiform, a little thickened upwards and yellowish brown.—*Sacc. Syll.* 2314.

On leaves of Scotch fir. Carlisle.

**Cenangium leoninum**, *Cke. & Mass.*

Cæspitose, subcoriaceous, stipitate. Cups at first turbinate, then expanded, 1-4 m.m. broad, stem penetrating, branched, expanding into the base of the cups, where it is radiately rugose, whole external surface golden brown or tawny orange, furfuraceously velvety, from the projecting septate cells of the exciple, disc at first poriæform, then expanded and plane, pale chestnut brown, margin connivent when dry. Asci cylindrical, stipitate, octosporous, sporidia ellipsoid, binucleate, continuous, hyaline, 9-10 × 4 $\mu$, paraphyses filiform.

On hard decorticated wood. Carlisle.

An elegant species, stem 10-15 m.m. long in some specimens and proliferous. The external hairs are about two septate, the diameter and length equal.

**Dermatea umbrina**, *Cke. & Mass.*

Cæspitose, erumpent, comparatively large, cups turbinate, tawny, then cinnamon, mealy, soon expanded and flexuous, disc umber, plane, nearly black when dry. Asci cylindrical, sporidia ellipsoid, at first nucleate, then faintly tinged with brown, 15-16 × 7 $\mu$, paraphyses linear.

On dead branches of *Ulex*. Carlisle.

Cups 1-2 m.m. broad. Stem very short, attenuated downwards, almost obsolete.

**Sclerodermis majuscula**, *Cke. & Mass.*

Erumpent, then superficial, large, scattered, tough, cups turbinate, then expanded, 5-7 m.m. broad, clove-brown externally, margin distinct, a little incurved, rugose when dry, smooth; disc dark purple brown, nearly plane; stem expanded upwards into the cup, 2 mm. long. Asci cylindrical, sporidia elliptical, a little attenuated at each end, triseptate, hyaline, 15 × 7 $\mu$, paraphyses filiform.

On oak bark. Carlisle.

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## EXOTIC FUNGI.

By M. C. Cooke.

**Lepiota ochrospora**, *Cke. & Mass.*

Pileus fleshy, large, 5 to 15 c.m. broad, pallid, soft, ovate, then expanded, umbonate, cuticle breaking into subpersistent darker scales, especially about the umbo; flesh 2 c.m. thick at the disc, thin at the margin, and faintly striate, stem hollow, erect, 6-15 c.m. long, attenuated from the sub-bulbous base, longitudinally striate, ring large, spreading, moveable, gills remote, ventricose, moderately broad, yellowish, becoming cinnamon when dry. Spores ovate, apiculate at the base, 8 × 6 $\mu$, ochraceous by transmitted light. Odour and taste pleasant.

On the ground. Coast Lands. British Guiana. (Jenman, 6359, 6426.)

"Reaching to eight inches in diameter, highly fragrant like the best mushroom, and equally edible." Many points of resemblance to *Lepiota procera*, but the spores are as distinctly coloured as those of many *Cortinarii*.

**Scutellinia strigosa**, *Pers. Syn.*, 648.

Sessile, small, cups at first subglobose, then concave, 1-2 m.m. diam., externally strigose, dark brown, disc subochraceous. Asci cylindrical, sporidia elliptical, becoming rough, 20-24 × 10 $\mu$, paraphyses thickened above. *Peziza fuscoatra*, var., Fries Syst. Myc.

On the ground. France.

External hairs densely beset, 150 $\mu$ long, 8 $\mu$ thick at the base, brown, septate, pallid at the attenuated apex. This cannot be referred to *S. fusco-atra*, Reb.

**Dasyscypha aleurodes**, *Cooke.*

Scattered or gregarious, ochraceous white, cups stipitate, at first clavate, then cup-shaped, externally clad with delicate deciduous hairs mixed with mealy granules, margin entire, stem cylindrical, equal below, expanding above into the base of the cup, asci cylindrically clavate, sporidia cylindrical, straight, 8-10 × 1 $\mu$, paraphyses filiform, slender.

On palm petioles. Nilgherries, India.

Cups $\frac{1}{2}$-1 m.m. broad, 1 m.m. high. Hyaline delicate hairs of the cup scarcely 50 $\mu$ long.

**Ascobolus sarawacensis,** *Cesati.*

Cups soon hemispherical, fleshy, brown (5 m.m. diam.), margin paler, granular as well as the external surface, flexuous when old, disc a little darker than the exterior. Asci cylindrically clavate, octosporous, sporidia elliptical, hyaline, then brown with a tinge of violet, smooth, 27-30 × 13-14 $\mu$, paraphyses filiform.

On buffalo dung. Sarawak. (Beccari, 226.)

**Ascobolus piceus,** *Limminghe.*

Cups semi-immersed, globose, then hemispherical ($\frac{1}{2}$ m.m. diam.), brown, smooth, disc flesh-coloured, concave. Asci subclavate, octosporous. Sporidia elongated, elliptical, at length tawny brown; smooth, 30-32 × 12 $\mu$, paraphyses thick, brown at the tips. *Peziza picea,* Limm. in Herb.

On sandy soil.

**Ascophanus lilacinus,** *Cooke.*

Minute (0·3-0·8 m.m. diam.), gregarious, cups urceolate, smooth, pale lilac; disc slightly concave, papillate; asci rather fusoid-clavate, octosporous, sporidia elliptical, hyaline, smooth (20 × 10 $\mu$), paraphyses filiform, longer than the asci, but not sensibly thickened at the tips.

On horse dung. New York. (Gerard, 67.)

**Midotis crispata,** *Berk. & Curt.*=Lachnea crispata, *Sacc. Syll., No.* 682.

This cannot belong to the *Peziceæ* at all, from its tough, leathery consistency. There are no hairs to be found anywhere on its surface, so that it could not possibly be a *Lachnea;* the only tomentum is that by which it is attached to the wood as a mycelium. Asci cylindrical, large, sporidia 8 elliptical, curved, or unequal-sided, binucleate, 25 × 8-10 $\mu$, smooth. Its closest affinities are with *Midotis macrotis.*

**Cenangium chrysoprasum,** *Cooke.*

Scattered, sessile, cups at first orbicular, hemispherical, then flattened, contorted when dry, tough, externally olive, furfuraceous, margin distinct, a little paler, incurved when dry. Disc concave, nearly plane, sulphur yellow. Asci cylindrically clavate, sporidia eight, narrowly ellipsoid, hyaline 6-8 × 2 $\mu$, paraphyses filiform.

On naked wood. India.

Cups 2-3 m.m. diam.

**Cenangium chlorascens,** *Schwein., N. A. F., No.* 873.

Cups rather large, 2-4 m.m., gregarious, contorted when dry, sessile or shortly stipitate, externally fibrously floccose, in a dry state black or very dark brown, but when moist æruginous green, disc greenish or yellowish green, at length powdery. Asci clavate, sporidia not seen.

On trunks. Carolina, U.S.A.

Some specimens on *Quercus*, others on *Taxodium distichum*.

This is *Cenangium fallax*, B. & R., Sacc. Syll. 2387, but Schweinitz's specific name will have priority.

**Cenangium contortum,** *B. & C. in Herb. Berk.*

Gregarious, black, cups at first orbicular, sessile, then variously contorted when dry, margin slightly elevated, then somewhat connivent (1-2 m.m. broad), smooth. Asci cylindrical, octosporous. Sporidia hyaline, allantoid, obtuse, 8 × 1½ μ.

On wood of *Cornus*. Alabama. 6385.

**Cenangium (Phæangium) patellatum,** *Cke.*

Erumpent, solitary, or two or three together, at length discoid, somewhat convex and umbilicate, externally brown, mealy, soon immarginate and rather contorted (2 m.m. diam.), abruptly produced into a short stem, disc black. Asci clavate, octosporous. Sporidia elongated, elliptical, continuous, a little attenuated to each end, tawny brown or amber-colour, 18-20 × 5-6 μ, paraphyses clavate.

On branches of *Acer*. Maine, U.S. (Sprague.)

**Patinella jecorina,** *Berk.*

Scattered or subgregarious, cups sessile, rather large, orbicular or flexuous, nearly plane, margin elevated, externally sooty-brown, disc black, smooth, asci cylindrical, sporidia ellipsoid, 7-8 × 4 μ, pale amber colour.

On naked wood. Admiralty Islands. (Challenger Expedition.)

Cups 3-5 m.m. broad.

**Patinella Carteri,** *Berk.*

On naked wood. Bombay.

Does not appear to differ from the above, as far as can be determined from the dried specimens. Size, colour, and sporidia are the same.

*Patellaria congregata*, B. & C. Does not appear to differ from *Durella compressa*.

**Phacidium quercinum,** *Desm. Exs., No.* 1644 = Cocoomyces.

Sporidia filiform, 80 × 1 μ.

**Phacidium arctostaphyi,** *Phil. & Hark.* (not Karst.) = Coccomyces.

Sporidia filiform, 80-95 × 2 μ.

**Stictis pinastri,** *De Lacr. in Desm. Exs.*, II., 791. = Coccomyces.

Sporidia filiform, multiguttulate, 85 × 1½ μ.

**Diplodia Larsdeniæ,** *C. & M.*

Gregarious, perithecia obturbinate, black, erumpent above, with a short ostiolum, sporules elliptical, for a long time continuous, and hyaline, with a granular plasma, at length uniseptate, not constricted, dark brown, 22 × 10 μ, on basidia of the same length.

On follicles of *Marsdenia*, in company with *Phoma folliculorum*, Lev. Queensland. (Bailey, 946.)

## OMITTED DIAGNOSES.*

By M. C. Cooke.

**Asterina crustosa,** *Berk. & Cooke.*

Epiphylla. Maculis orbicularibus atris opacis, crustosis. Peritheciis applanatis, in maculas congestis confluentibusque. Ascis saccatis octosporis. Sporidiis ellipticis utrinque subacuminatis uniseptatis constrictis fuscis (·035 × ·012-·014 m.m.)

On leaves of *Eugenia.* Ceylon (Thwaites in Herb. Berk.).

**Dimerosporium ilicinum,** *Cke.*

Hypophyllum. Mycelio tenui atrofusco, effuso. Peritheciis sub-globosis atris minimis (·08-·12 m.m. diam.), membranaceis fuscis ascis pyriformibus octosporis. Sporidiis ellipticis, uniseptatis (immaturis hyalinis ·018 × ·009 m.m.).

On leaves of *Ilex myrtifolium.* U. States (Ravenel, No. 1916).

**Capnodium ramosum,** *Cooke.*

Hypophyllum, atrum, lanosum, demum subcrustaceum. Peritheciis erectis bifurcatis, ramosisque, sursum attenuatis (·3 m.m. long; ·03 m.m. ad basim lat.), mycelio denso fusco immixtis. (Ascis n. v.).

On leaves of Mango (55), in Herb. Berk.

**Microthyrium Sprucei,** *Cooke & Mass.*

Epiphyllum. Peritheciis sparsis, superficialibus, scutiformibus, membranaceis, margine fimbriatis (·5 m.m. diam.), vix centro pertusis, ascis elliptico-clavatis, octosporis. Sporidiis inordinatis, fusiformibus 3-5 septatis, hyalinis (·028-·032 × ·008-·009 m.m. diam.).

In foliis "Arara-apoku." St. Gabriel, Brazil (Spruce, No. 492).

**Micropeltis (clypeolum) Amazonicum,** *Cke. & Mass.*

Epiphyllum. Peritheciis sparsis, conico-convexis, dimidiato-scutatis (·3 m.m. diam.), carbonaceis, astomis. Ascis cylindraceis, breviter stipitatis octosporis. Sporidiis arcte lanceolatis, uniseptatis, non constrictis, hyalinis (·015-·018 × ·0035 m.m.).

In foliis coriaceis dejectis. Maribitanas (Spruce, 639).

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* These diagnoses, which have been written many months and mislaid, do not appear to have been published.

# NOTES ON TYPE SPECIMENS IN THE ROYAL HERBARIUM, KEW.

By G. Massee.

The following measurements of spores and cystidia of Agarics belonging to the section *Rhodosporæ* are all drawn up from type specimens in the Kew Herbarium:—

**Ag. (Metraria) insignis**, *Cke. & Mass.*, *Sacc. Syll.*, *V.* ix. (*suppl.*), *No.* 348.

Spores elliptic, base obliquely apiculate, smooth, 10 × 6 μ; no cystidia.

**Ag. (Annularia) insignis**, *Cke. & Mass.*, *Grev.*, xviii., *p.* 3.

Spores globose, base minutely apiculate, smooth, 5 μ; no cystidia.

**Ag. (Volvaria) Thwaitesii**, *Hook. fil.*, *in Berk. Dec. Fung.*, *No.* 286.

Spores elliptical, smooth, 7-8 × 4 μ; no cystidia.

**Ag. (Volvaria) pseudo-volvaceus**, *B. & Br.*, *Linn. Soc. Journ.*, *Vol.* ix., *p.* 530.

Spores elliptical, smooth, 5 × 3 μ; no cystidia.

**Ag. (Volvaria) Loveianus**, *Berk.*, *Engl. Flora*, *Vol.* v., *p.* 104.

Spores elliptic, oblong, smooth, 4-5 × 2·5-3 μ; no cystidia.

**Ag. (Volvaria) Taylori**, *Berk.*, *Outl.*, *p.* 140.

Spores subglobose or broadly elliptical, averaging 5 × 4 μ, smooth; no cystidia.

**Ag. (Volvaria) diplasius**, *B. & Br.*, *Linn. Trans.*, xvii., *p.* 151, *t.* 33, *c.*

Spores elliptical, with an oblique basal apiculus, smooth, 7-8 × 4 μ; no cystidia.

**Ag. (Volvaria) apalotrichus**, *B & Br.*, *Journ. Linn. Soc.*, *Vol.* xi., *p.* 530.

Spores minute, broadly elliptical, smooth, 3 × 2 μ; no cystidia.

**Ag. (Volvaria) coleatus**, *B & Br.*, *Journ. Linn. Soc.*, *Vol.* xi., *p.* 530.

Spores elliptical, smooth, 3 × 2 μ; no cystidia.

**Ag. (Volvaria) microcoelius**, *B. & Br.*, *Journ. Linn. Soc.*, *Vol.* xi., *p.* 531.

Spores globose, minutely apiculate at the base, smooth, 3·5-4 μ; no cystidia.

**Ag. (Volvaria) geaster**, *B. & Br.*, *Journ. Linn. Soc.*, *Vol.* xi., *p.* 530.

Spores elliptical, smooth, base apiculate, 7 × 4 μ; no cystidia.

**Ag. (Volvaria) glandiformis**, *B. & Br.*, *Journ. Linn. Soc.*, *Vol.* xi., *p.* 531.

Spores broadly elliptical, smooth, 3·5 × 2 μ; no cystidia.

**g. (Volvaria) temperatus**, *B. & Br., Ann. Nat. Hist., No.* 1757 (1879).

Spores elliptical, smooth, 4 × 2·5 μ; no cystidia.

**Ag. (Volvaria) terastius**, *B & Br., Trans. Linn. Soc., Vol.* XXVII., *p.* 151, *pl.* 34.

Spores subglobose, smooth, 4 μ diam., or 4 × 3 μ; cystidia absent.

**Ag. (Volvaria) xanthocephalus**, *Berk., Dec. Fung. n.* 26, *in Lond. Journ. Bot.*, 1845, *p.* 45.

Spores broadly elliptical, smooth, 5 × 3 μ; no cystidia.

**Ag. (Volvaria) primulinus**, *Cke. & Mass. Grev., Vol.* XIX., *p.* 1.

Spores elliptical, smooth, 10 × 6 μ; no cystidia.

**Ag. (Pluteus) subcervinus**, *B. & Br., Journ. Linn. Soc.*, XI., *p.* 531.

Spores subglobose, with a basal apiculus, smooth, 5 μ diam.; cystidia numerous, more or less ventricose, apex, with a variable number of spicules, 60-70 × 9-10 μ.

**Ag. (Pluteus) brunneo-pictus**, *B. & Br., Journ. Linn. Soc., Vol.* XI., *p.* 533.

Spores elliptical, with an oblique basal apiculus, smooth, 7-8 × 4 μ; no cystidia.

**Ag. (Pluteus) Æolus**, *B. & Br., Journ. Linn. Soc., Vol.* XI., *p.* 531.

Spores subglobose, with a basal apiculus, smooth, 6-7 μ diameter; no cystidia.

**Ag. (Pluteus) spilopus**, *B. & Br., Journ. Linn. Soc., Vol.* XI., *p.* 532.

Spores subglobose, with a distinct basal apiculus, smooth, 5-6 μ diam.; no cystidia.

(Syn. *Ag.* (*Pluteus*) *podospileus, Sacc. & Cub., Sacc. Syll., Vol.* V., *No.* 2773!)

The present species has been described twice by Berkeley and Broome, first as quoted above, from Ceylon specimens. These authors afterwards met with the same species in England, and gave a description of it in Ann. Nat. Hist., No. 1856. This last description was considered by Saccardo, on account of some minor differences in the two diagnoses and spore measurements, to be distinct from the Ceylon species, which is not the case, the British and Ceylon specimens in the Herbarium agreeing in all essential points.

**Ag. (Pluteus) tephrostictus**, *B. & C., Journ. Linn. Soc., Vol.* X., *p.* 289.

Spores subglobose, apiculate at the base, smooth, 5 × 4 μ; no cystidia.

**Ag. (Pluteus) escharites**, *B. & Br., Journ. Linn. Soc., Vol.* XI., *p.* 533.

Spores elliptic-fusiform, very minutely warted, 10 × 6 μ; no cystidia.

**Ag. (Pluteus) psichiophorus**, *B. & Br., Journ. Linn. Soc., Vol.* XI., *p.* 532.

Spores subglobose, apiculate at the base, smooth, 4-5 μ diam.; no cystidia.

**Ag. (Pluteus) violarius**, *Mass., Grev., Vol.* XIII., *p.* 89.
Spores subglobose, smooth, 5-6 $\mu$; no cystidia.

**Ag. (Pluteus) albo-lineatus**, *B. & Br. Journ. Linn. Soc., Vol.* XI., *p.* 532.
Spores subglobose, smooth, 4-5 $\mu$; no cystidia.

**Ag. (Entoloma) sagittæformis**, *K. & Cke., Grev., Vol.* IX., *p.* 114.
Spores irregularly globose, coarsely nodulose, 8-9 $\mu$; no cystidia.
(The description of the spores is wrong in the original diagnosis.)

**Ag. (Entoloma) pallido-gilvum**, *B. & Br., Journ. Linn. Soc.*, XI., *p.* 538.
Spores broadly pyriform, apiculate at the base, even, or sometimes very slightly angular, 6 × 5 $\mu$; no cystidia.

**Ag. (Entoloma) stylophorus**, *B. & Br.*
Spores subglobose or slightly elongated, coarsely nodulose, 10 $\mu$ diam., or 12 × 10 $\mu$; no cystidia.
The pileus is sometimes depressed, and the umbo resembles an elongated mucro.

**Ag. (Entoloma) microcarpus**, *B. & Br., Journ. Linn. Soc.*, XI., *p.* 536.
Spores obliquely elliptical, smooth, 5-7 × 3·5 $\mu$; no cystidia.

**Ag. (Entoloma) chrysægis**, *B & Br., Journ. Linn. Soc., Vol.* XI., *p.* 536.
Spores subglobose, smooth, almost colourless by transmitted light, 5 × 6 $\mu$; no cystidia.

**Ag. (Entoloma) mazophorus**, *B. & Br., Journ. Linn. Soc., Vol.* XI., *p.* 537.
Spores subglobose, coarsely angularly nodulose, 10 $\mu$ diam.; no cystidia.

**Ag. (Entoloma) Bloxami**, *Berk., Outl., p.* 143.
Spores subglobose, with a distinct basal apiculus, very sparsely and minutely echinulate or quite smooth, 9-10 $\mu$; no cystidia.

**Ag. (Entoloma) ameides**, *B. & Br., Ann. Nat. Hist., No.* 999 (1865).
Spores angularly globose, coarsely warted, 10 $\mu$ diam.; no cystidia.

**Ag. (Entoloma) retroflexus**, *B. & Br., Journ. Linn. Soc., Vol.* XI., *p.* 536.
Spores globose with a slight indication of angular irregularities, 5 $\mu$ diam.; no cystidia.
The present is undoubtedly a species of *Hebeloma;* the gills are pale ochraceous-tan, the spores are also tinged with the same colour, and do not show a trace of red or pink.

**Ag. (Entoloma) intermixtus**, *B. & Br., Journ. Linn. Soc.*, XI., *p.* 537.
Spores obliquely elliptical, 7 × 4 $\mu$; no cystidia.

**Ag. (Entoloma) iodnephes**, *B. & Br., Journ. Linn. Soc.*, XI., *p.* 536.
Spores angularly globose, 8-10 $\mu$; no cystidia.

**Ag. (Entoloma) panniculus,** *Berk., Flor. Tasm., p.* 245.
Pileus and stem deep steel-blue with a purple tinge; gills broadly adnate, dingy tan with a tinge of pink, base of stem white and cottony; spores elliptic-oblong, apiculate,warted, 10-11 × 7 $\mu$; no cystidia.

**Ag. (Entoloma) argilophyllus,** *B. & Br., Journ. Linn. Soc.*, XI., *p.* 538.
Spores elliptical, smooth, 8 × 5 $\mu$, pale dingy ochraceous; cystidia cylindrical, 70-80 × 12-14 $\mu$, abundant. The present species is a true *Hebeloma;* gills very ventricose, 2 lines broad in the middle, deeply sinuate, and almost free, dry and thin, pale dingy tan.

**Ag. (Entoloma) Thomsoni,** *B. & Br., Ann. Nat. Hist., No.* 1523.
Spores elliptical, smooth, 6 × 3-5 $\mu$; no cystidia.

**Ag. (Entoloma) Wynnei,** *B. & Br., Ann. Nat. Hist., No.* 1342.
Spores elliptic-oblong, apiculate, warted, 10-11 × 7-8 $\mu$; no cystidia.

**Ag. (Entoloma) bulbigenus,** *B. & Br., Ann. Nat. Hist., No.* 1937.
Spores subglobose or very broadly pyriform, apiculate, 7 × 5 $\mu$; no cystidia.

**Ag. (Entoloma) cystopus,** *Berk., Decad., No.* 285.
Spores elliptic-oblong, apiculate at the base, warted, 9 × 5 $\mu$; no cystidia.

**Ag. (Entoloma) galbineus,** *Cke. & Mass., Grev.*, XVII., *p.* 7, *& Grev.* XIX., *p.* 5.
Spores stellately angular, 10 $\mu$ diam.; no cystidia.

**Ag. (Entoloma) læticolor,** *Cke. & Mass., Grev.*, XVI., *p.* 31.
Spores subglobose, coarsely warted, 12-14 $\mu$ diam.; no cystidia.

**Ag. (Entoloma) melaniceps,** *Cke. & Mass., Grev.*, XVI., *p.* 31.
Spores subglobose, smooth, apiculate, 10-12 $\mu$ diam.; no cystidia.

**Ag. (Leptonia) assularum,** *B. & C., Ann. Nat. Hist., Oct.*, 1859.
Spores elliptic-oblong, apiculate at the base, warted, 10-12 × 7-8 $\mu$; no cystidia.

**Ag. (Leptonia) gnaphalodes,** *B. & Br., Journ. Linn. Soc.*, XI., *p.* 539.
Spores angularly globose, 12-14 $\mu$; no cystidia.

**Ag. (Leptonia) hyphoporphyrus,** *B. & C., Journ. Linn. Soc.*, X., *p.* 289.
Spores globose, with a basal apiculus, warted, 10 $\mu$ diam.; no cystidia.

**Ag. (Lepiota) virescens,** *B. & C., U. S. Explor. Exped., No.* 37.
Spores angularly globose, 10 $\mu$ diam.; no cystidia.

**Ag. (Lepiota) variecolor,** *B. & C., Ann. Nat. Hist., Oct.*, 1859.
Spores globose, with a basal apiculus, warted, 8-9 $\mu$ diam.; no cystidia.

**Ag. (Leptonia) quinquecolor,** *Cke. & Mass., Grev.*, XVII., *p.* 7, *&* XIX., *p.* 5.=(Ag. (Entoloma) flavido-rufus, *Cke. & Mass., Grev.*, XV., *p.* 99.)
Spores angularly globose, apiculate at the base, 8-10 $\mu$ diam.; no cystidia.

**Ag. (Leptonia) melanurus**, *Cke. & Mass., Grev.*, XIX., *p.* 89.
Spores elliptical, smooth, 7 × 5 μ; cystidia scanty, broadly fusiform, apex truncate, and furnished with a varying number of short spicules, 80-90 × 15-20 μ.

**Ag. (Nolanea) Babingtonii**, *Bloxam, in Berk. Outl., p.* 148.
Spores globose or broadly oblong, apiculate, coarsely warted, 10-11 × 8 or 10-11 μ; no cystidia.

**Ag. (Nolanea) fulvo-lanatus**, *B. & Br., Journ. Linn. Soc.*, XI., *p.* 529.
Spores elliptic-oblong, apiculate, warted, 9-10 × 7 μ; no cystidia.

**Ag. (Nolanea) rufo-carneus**, *Berk., Engl. Flora, V.* V., *p.* 81.
Spores elliptical, with an oblique apiculus, smooth, 12 × 7 μ; no cystidia.

**Ag. (Nolanea) elaphines**, *B. & Br., Journ. Linn. Soc.*, XI., *p.* 540.
Spores angularly globose, apiculate, 10 μ; no cystidia.

**Ag. (Nolanea) lasius**, *B. & Br., Journ. Linn. Soc.*, XI., *p.* 539.
Spores oblong, apiculate, warted, 14 × 10 μ; no cystidia.

**Ag. (Nolanea) quadratus**, *B. & C., Ann. Nat. Hist.* (*Oct.*, 1859), *Vol.* IV., *Ser.* 3.
Spores often almost regularly octahedral in outline, otherwise globosely angular, apiculate at the base, 12-14 μ diam.; no cystidia.

**Ag. (Nolanea) rubidus**, *Berk., Mag. Zool. & Bot., Vol.* I., *t.* 2, *f.* 2.
Spores elliptical, smooth, 5 × 3 μ; no cystidia.

**Ag. (Nolanea) helictus**, *Berk. Journ. Linn. Soc.*, XV., *p.* 1 (1873).
Spores subglobose, coarsely nodulose, 8-9 μ; no cystidia.

**Ag. (Nolanea) fulvo-strigosus**, *B. & Br., Ann. Nat. Hist., No.* 1650.
Spores elliptic-oblong, nodulose, with a basal apiculus, 10 × 6 μ, cystidia scanty, fusiform, apex rather acute and entire, 40-50 × 7-8 μ.

**Ag. (Clitopilus) abortivus**, *B. & C., Ann. Nat. Hist.*, 1859, *p.* 289.
Spores elliptic-oblong, apiculate, warted, 8 × 5 μ; no cystidia.

**Ag. (Clitopilus) subgilvus**, *B. & Br., Journ. Linn. Soc.*, XI., *p.* 53.
Spores elliptical, with an oblique apiculus, smooth, 5 × 2-5 μ; no cistidia.

**Ag. (Clitopilus) cretatus**, *B. & Br., Ann. Nat. Hist.*, 1861, *p.* 1, *No.* 903.
Spores subglobose, smooth, 4-5 μ; no cystidia.

**Ag. (Clitopilus) stilbocephalus**, *B. & Br., Ann. Nat. Hist.* (1879), *p.* 205, *No.* 1758.
Spores elliptic-oblong, with a basal apiculus, coarsely nodulose, 12 × 7-8 μ; no cystidia.

**Ag. (Clitopilus) tephrus**, *B. & Br., Journ. Linn. Soc.*, XI., *p.* 53.
Spores subglobose, with a basal apiculus, smooth, 4 μ; no cystidia.

**Ag. (Clitopilus) straminipes**, *Massee, Grev.*, XVI., *p.* 43.
Spores globose, coarsely nodulose, 10-12 $\mu$ diameter; no cystidia.

**Ag. (Eccilia pyrinus)**, *B. & C., Ann. Nat. Hist., Vol.* IV., *Ser.* 3 (1859).
Spores elliptic-oblong, with a basal apiculus, warted, 8-9 × 6 $\mu$; no cystidia.

**Ag. (Eccilia) hyalopedes**, *B. & Br., Journ. Linn. Soc.*, XI., *p.* 540.
Spores subglobose, coarsely warted, 10-12 $\mu$ diameter; no cystidia.

**Ag. (Eccilia) griseo-carneus**, *B. & Br., Ann. Nat. Hist.* (1865), *pl.* XIII., *fig.* 1.
Spores elliptic-oblong, warted, $7 \times 5$ $\mu$; no cystidia.

**Psilopezia mirabilis**, *Berk. & Curt.*
The type specimen of this species proves to be identical with *Aleurodiscus Oakesii*, Cooke.

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## Bibliography.

*Vergleichende Morphologie der Pilze* (Comparative Morphology of Fungi). Dr. F. von. Tavel.—In the present excellent book we have a clear account of the morphology of fungi, based on the numerous researches of Dr. Brefeld, as described in his "Untersuchungen aus dem Gesammtgebiet der Mykologie," of which the present may be considered a condensed and correctly interpreted account, as the author has been for some time engaged in assisting Brefeld in his researches. There are numerous excellent illustrations showing the most important structural features of typical members of each group, also secondary forms of fructification, where such have been determined by carefully conducted experiments. The book is indispensable to all who wish to keep abreast of the subject, and would also prove of value to those who consider the modern departures in systematic arrangement from those of Fries, Persoon, or Corda, as being due more to the desire for change than to the outcome of prolonged research.

*North American Heliscoporæ*. A. P. Morgan (Cincinnati Soc. Nat. Hist., 1892).—An excellent example of careful and painstaking work. The author has ignored the modern method of attempting to make what is usually considered a complete monograph, by introducing species he has not seen, and justifying their rearrangement by gratuitous comments and suppositions. The species are described in detail, and each one is illustrated in a manner that shows at once the author's familiarity with the species under consideration.

It may be well to explain a point in connection with this subject

that should have been done before. In Berkeley's Herbarium I found a fungus belonging to the Helicosporæ, marked "*Hobsonia*, n.g.," but which had not been described. Finding that this fungus did not agree generically with anything known to me, it was described as *Hobsonia*, Berk., in Ann. Bot., Vol. v., p. 509; the species as *H. gigaspora*, Berk., l.c., fig. 1. Professor Farlow has since kindly pointed out that the above is identical with a species described by Peck as *Helicomyces mirabilis*, and a specimen communicated by Professor Farlow proves this statement to be correct. The species is involved in mucilage when moist, hard and horny when dry, hence cannot be a species of Helicomyces, according to Saccardo's arrangement, and the genus *Hobsonia* can stand. Berkeley's specimen was from Venezuela, and I have since received the same species from St. Vincent, and Dominica, W. Indies. (G. M.)

*The California Vine Disease.*—The U.S. Deparment of Agriculture has issued a bulky preliminary report on this subject, prepared by Newton B. Pierce. The report deals with the subject from both historical and practical points of view, the outcome of numerous investigations in various parts of the United States and in Europe, and is illustrated by many plates and maps.

*Description of a New Phalloid.* A. P. Morgan (Cincinnati Soc. Nat. Hist., Oct., 1892).—The very remarkable fungus described, although undoubtedly belonging to the Phalloideæ, differs in many important points from the structure typical of that group, more especially in the absence of a differentiated volva, and in the absence of a gelatinous stratum between the two layers of the peridium, and, as the author observes, forms a closer connection between the Phalloideæ and the Lycoperaceæ than has hitherto been known. The following is the generic diagnosis:—

**Phallogaster**, *Morgan.* Mycelium fibrous, much branched. Peridium obovoid, consisting of two concrete layers, an inner and an outer one, rupturing irregularly. Gleba composed of numerous roundish irregular masses, or lobes of a green colour, attached to the inner surface of the upper part of the peridium; spores oblong, minute, hyaline.

The species, *P. saccatus*, has a peridium 1-2 in. high by ½-1 in. wide, often in small clusters, and with the habit of *Lycoperdon pyriforme*, springing from white, stringy mycelium. The peculiar phalloid smell is present, but not so powerful as in some other members of the family.

*A Probable New Category of Carnivorous Plants.* Conway MacMillan (Bot. Gaz., Vol. xvii., p. 380).—The author points out "the fact that members of the genus Polyporus are in the habit of catching and digesting small insects is not generally known." "In *Polyporus applanatus* the method of catching and devouring the insects has been studied by me." The studies have shown that numerous flies, both small and large, walk about and

appear to feed upon the soft substance of the hymenophore of the above-named fungus. Now and again an unfortunate fly gets its foot fast in a cleft of the hymenium, and is unable to extricate itself, the result being it shortly dies, and is promptly covered by a growth of mycelium that springs from the interior of the fungus; eventually the body of the deceased victim decreases in bulk, and the author considers that this is due to its having been digested by the fungus. Whether the death of the victim is due to poisoning or simply to fatigue has unfortunately not yet been determined. It is admitted that the plant cannot be conceived to derive any great amount of nourishment from its unfortunate victims, nevertheless small beginnings sometimes lead up to unexpected and important results, and the author considers that "it is easy to see how such a practice, if persisted in, might develop into a highly-important nutritive habit."

Mycologists will be pleased to learn that fungi are beginning to turn the tables on their insect enemies, and many will no doubt hope that they may turn their attention to the maggots that greatly aid in the untimely destruction of so many individuals.

Stronger evidence than the mere fact of the flies becoming surrounded by a weft of hyphae and diminishing in bulk will be required, before the insectivorous propensities of *Polyporus* can be considered as being established.

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## HEPATICÆ SPRUCEANÆ: AMAZONICÆ ET ANDINÆ.

Under the above title a fasciculus is being published, comprising specimens of all those hepatics described in the work "*Hepaticæ of the Amazon and Andes*," which were gathered in sufficient quantity for distribution; with a few additional ones that were left undetermined when that work was printed. The sets contain about 400 species, all named, and the price is 30 shillings the hundred.

It is hardly necessary to observe that no such extensive collection of Hepaticæ Exsiccatæ has ever been offered to the public in any country. The specimens are all named; a much larger proportion than usually found in collections of this tribe are in a perfect state, and several of them are of extreme rarity and beauty.

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## ALGÆ.

### On the Necessity for Removing Ectocarpus secundus, Kütz., to a New Genus.

By E. A. Batters, B.A., LL.B., F.L.S.

In the genus *Ectocarpus* the ciliated zoospores are produced in well-defined sporangia, some of which are multilocular, while others are unilocular; only the spores produced in the multilocular sporangia, however, have been observed to conjugate, those produced in the unilocular sporangia being, in all probability, asexual. In *Ectocarpus siliculosus* (the typical species of the genus) the planogametes are, according to Berthold, at first similar in every respect; some of them, however, soon withdraw their cilia and come to rest, while others remain actively motile. One of the still actively motile gametes then coalesces with one that has come to rest to form the zygospore; should the gametes fail to conjugate, however, they are still capable of germinating independently. Dr. Bornet has shown, quite recently, that in certain species, *e.g.*. *Ect. secundus*, Kütz., which have up to the present been ranked in the genus *Ectocarpus*, there is a much more marked differentiation of the sexual cells, the male and female cells being developed in distinct sporangia—antheridia and ogonia. The male cells, which are much smaller than the female, are produced in sporangia of a clear orange colour, while the larger female cells are borne in deeply coloured multicellular sporangia similar to the ordinary plurilocular sporangia of the typical species of *Ectocarpi*. No asexual sporangia have been observed on the species bearing antheridia, and Dr. Bornet conjectures that the latter are the homologues of the unilocular sporangia of the typical forms. The antherozoids are colourless and similar in all respects to those of *Cutleria* or *Fucus*. Taking the facts above stated into consideration it seems to me inadmissible to retain in the same genus plants like *Ectocarpus siliculosus*, Lyngb., in which, as has been seen, the reproductive process is isogamous, the male and female cells as well as the sporangia in which they are produced being similar in every respect—and *Ectocarpus secundus*, Kütz.—in which the male cells and the sporangia in which they are produced differ in several important particulars from the female cells and their sporangia. I propose, therefore, to remove *Ect. secundus*, Kütz. and its allies to a new genus, which, in memory of the late Miss I. Gifford, of Minehead, I have called *Giffordia*. The new genus will be characterized as follows:—

**GIFFORDIA**, *nov. gen.*

Thallus as in *Ectocarpus*. Sexual reproduction by means of planogametes. Female gametes produced in plurilocular gametangia; male cells in antheridia of similar form. Antherozoids much smaller than the female zoospores and destitute of chromatophores.

The new genus will contain the following species:—*G. secunda*=*E. secundus*, Kütz.; *G. fenestrata*=*Ect. fenestratus*, Berk.; *G. Lebelii*=*E. Lebelii*, Crn. (perhaps identical with *G. fenestrata*), and Mr. Buffham's new species *G. Padinæ*, Buffh. (*vide post*).

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## ALGOLOGICAL NOTES.

By T. H. Buffham, A.L.S.

(*Plate* 185.)

*The plurilocular sporangia of* **Chorda Filum**, *Stackh.*

In August last, when collecting at Teignmouth, I observed a curious specimen of this alga growing amongst others of a normal appearance in a shallow rock-pool near the long bridge over the tidal river Teign. For some distance from the apex it was twisted so as to form a close spiral. On examining a section I was surprised to see a considerable number of larger bodies of a bright brown colour amongst the usual assimilation cells, and projecting beyond them. Familiar with the unilocular sporangia, of which none were visible, my first thought naturally was that the much larger bodies were parasites which had caused the abnormal growth of the host, especially as in those portions of the frond between the projecting spirals they were either absent or almost so. A closer scrutiny, however, showed that they evidently arose from the same base as the assimilation cells, and, in fact, they were those cells transformed into plurilocular sporangia. The form, seen laterally, is subspherical, with the upper portion truncate, on a short pedicel, reminding one somewhat of the edible fig (*Ficus carica*).

Having nipped off only a portion of the plant I went next day and found the remainder, and, further, collected all the specimens I could find (7 or 8) that were distinctly spiral. Every one, with a single exception, bore the plurilocular sporangia. The exception, however, was an abnormal form, much thickened in parts, very similar to Fig. 2, of Tab. 26, of Reinke's *Atlas deutscher Meeresalgen*. I carefully examined a plant of the usual straight form growing close to my first specimen, but found no plurilocular sporangia. It was richly furnished with unilocular.

I now examined from base to apex a plant 13 dm. (50 inches)

in length, which was spiral throughout all but the lowermost sixth. Fig. 1 represents this one-eighth its natural size. From near the base to a little below the first appearance of twist (1*a*) only unilocular sporangia were found. Then a few plurilocular intermixed with unilocular (*a*-*b*). When spirality became marked (*b*-*c*) the proportions were reversed, and in the uppermost third of the plant (*c*-*d*) the plurilocular became more numerous and the unilocular absent. In short, the plurilocular were proportionately numerous as the spirals became closer.

The surface view of the projecting part of a spiral shows some of these bodies disposed in small groups, others scattered, or with a tendency to a linear arrangement in the direction of the spiral. The outline is subquadrate, and usually the cruciate appearance is manifest even early in the development of the upper portion of the assimilation cell into a sporangium (Fig. 2).

In these spiral plants it is, of course, impossible to obtain a circular section. Fig. 3 shows a section of a spiral which is itself composed of several minor ridges and furrows, and it is especially on the most projecting portions that the plurilocular sporangia are most numerous. In the lower part of the figure with a circular outline they are almost, if not quite, absent, and here (as already indicated), in the portion of the plant where the spirals are looser, the unilocular may be present. It is also curious to note that in such a section the internal parenchyma of long cells may be shown in all aspects, transverse, longitudinal, and intervening diagonal.

The assimilation cells destined to form plurilocular sporangia become swollen at the upper end, and granules form therein; very early they exhibit a kind of cruciate parting when seen from above (Fig. 2). As the enlargement becomes more globose a partition is formed below (Fig. 4*b*), and the pedicel thus produced becomes shorter as maturity is approached. When quite mature the breadth of sporangium is 35-40 $\mu$. These bodies then form a striking contrast to the delicate greenish unilocular sporangia (Fig. 4*a*). The compartments are about 4 $\mu$ in width. When empty the longitudinal divisions are readily seen, with traces of the transverse ones (Fig. 4*e*), but owing to the pressure on all sides the empty sporangia soon disappear. The zoospores appear to be discharged from an opening in each quarter. I am unable to say from actual observation if they perform the rôle of gametes. I do not recall any hitherto known plurilocular sporangium that resembles this curious form.

The spiral twist is evidently the result of a local production of the plurilocular sporangia induced, possibly, by exposure to sunshine on one side more than the other. (I found these specimens in shallow pools exposed to such an influence, where the plants were prone for hours with water constantly flowing over them.)

Pressure of these large bodies on the adjacent assimilation cells would affect the direction of the cells of the tender parenchyma below, and this, when once started, would tend to be intensified, particularly as the sporangia first appear at the free end of the plant, which is also the older.

I requested Mr. J. T. Neeve, of Deal, to send me any twisted specimens of *Chorda Filum* he might see. The only one, however, which he has been able to send was a waif, very battered and worn, and considerably decomposed, picked up in November. The spiral character was not very marked. I found, however, here and there small groups of the plurilocular sporangia amongst abundance of unilocular.

**Giffordia Padinæ**: *a new marine alga.*

Algologists are greatly indebted to the distinguished Dr. Ed. Bornet for his *Note sur quelques Ectocarpus* (Bull. de la Soc. Bot. de France, 1891), in which he shows that the reproductive organs of plants still included in this large genus offer remarkable differences. Of two species (*E. secundus* Kütz., and *E. Lebellii* Crn.) which possess antheridia of an orange tint, containing antherozoids, and zoogametangia of a similar form, Mr. Batters has formed a new genus—*Giffordia*. Since they were described by Dr. Bornet in *Études Phycologiques* (p. 24), in 1878, antheridia have been observed on no other species of *Ectocarpi*.

In September, 1891, at Sidmouth, I found a minute Ectocarpoid plant growing on the lower part of *Padina Pavonia* Gaill. The orange tint of some bodies upon it arrested attention. Sections of the host were found too destructive of the epiphyte, which is best studied by teasing out pieces of the *Padina*. It is attached to its host by a very short root-like filament which is inserted between two cells of the *Padina*. In the earliest form it consists of an erect simple filament of but a few cells in length. Quite close to the base, on a bent pedicel of two or three short cells, an antheridium is placed. This is ovate-lanceolate in outline, sometimes mucronate, up to 105 $\mu$ long by 52 $\mu$ in greatest width, filled with pale orange bodies arranged in regular tiers, and occupying about 4 $\mu$ in height (Fig. 6). Sometimes there are two antheridia at the base, or there may be an antheridium and a plurilocular sporangium. The latter bodies are similar in form to the antheridia, but generally longer, and may reach a length of 130 $\mu$, and a breadth of 55 $\mu$.

A sporangium is usually so much like that of *Acinetospora pusilla* Born. (*Ectocarpus pusillus* Griff.) that I was strongly inclined to regard my small plant as a sexual condition of *A. pusilla*. Dr. Bornet, however, to whom I owe my sincere thanks for the careful examination he made of specimens sent him, pointed out that when the smaller specimens bearing antheridia had also a mature sporangium the bodies contained in this were considerably

smaller than the quiescent spores of *A. pusilla*. He thinks, however, that the largest specimens found on *Padina* belong actually to the latter species. In any case the bodies are about 10 $\mu$ in diam., and they are arranged rather loosely (Fig. 7). They are still considerably larger than the zoogametes in *Giffordia* (*Ect.*) *Lebelii*, which are about 7 $\mu$ in diam., and the sporangium of the latter is quite crowded and turgid when mature.

An older plant may consist of three or four filaments, up to 2 or 3 m.m. (Fig. 5), arising from the base, and bearing sporangia (5*b*), but an antheridium is rarely found (5*a'*) excepting at the base (5*a*). Still larger specimens possess only the sporangia, and have sometimes a few simple branches on the primary filaments.

There can be no doubt as to the character of the bodies in the antheridium although not observed outside. As to the sporangia it is assumed that these contain *ciliate* gametes. It appears to me, however, taking into account the association with *Acinetospora pusilla*, that it is not impossible that this small plant may be the sexual form of *A. pusilla* with either ciliate or quiescent gametes, and that the form known so long to Dr. Bornet, and bearing plurilocular sporangia containing quiescent spores, may be the neutral state of the same species. Until this be proved or otherwise I may be permitted to propose the following characters :—

**Giffordia Padinæ**, sp. n.

Erect filaments 1-3 m.m. high, 25 $\mu$ diam., attenuated at base to 17 $\mu$, simple or slightly branched : one or more arising from a short filamentous root inserted between the cells of the host. Cells of filaments about twice as long as wide. Antheridia ovate-lanceolate in outline, pedicellate, at the base of erect filaments, or rarely a few cells higher : up to 105 $\mu$ long and 52 $\mu$ wide ; antherozoids about 4 $\mu$ in diam. Gametangia long-ovate, pedicellate or sessile, at intervals on the erect filaments, occasionally at base : up to 130 $\mu$ long and 55 $\mu$ wide. Gametes about 10 $\mu$ in diam.

Hab. On *Padina Pavonia* Gaill. Sidmouth. August.

*Conjugation of zoogametes in* **Cladophora lanosa** *Kütz.*

The aspect of this alga is rather striking when bearing gametes. The ordinary cells are very pale and delicate in appearance, and in length about twice the diam., whereas the fertile cells are very dark, only about as long as the diam., and form groups of four to a dozen or more near the middle of the principal filaments and the adjacent bases of branches (Fig. 8).

Very early in their development the contents of the fertile cells have a slightly brownish tinge, and when mature they have become so brown that it is difficult to see any trace of green. The gametes, while still within the cell, move rather vivaciously for some time (Fig. 9*a*), and the whole of the cell contents then

escape, by a narrow opening near the upper end of the cell, as a gelatinous mass enclosing within it the rapidly moving bodies (Fig. 9*b*). When once outside (Fig. 9*c*) their efforts seem redoubled with the object, apparently, of freeing each from the entanglement of the mucilage. The mass becomes looser, and one by one the individuals break away, spin round, return, and re-perform in the most lively manner the usual movements of these ciliate bodies. To observe at once a dozen contiguous cells, some filled with the moving masses, others with their contents recently discharged and just outside in even more violent motion, while a few of the exterior groups are loosening,—all this is a most entertaining sight to the student.

After swimming about for some time their movements become a little more sedate. A pair will waltz pretty rapidly together with their cilia touching (Fig. 10*a*); and shortly afterwards, the motions having gradually become slower, the hyaline beaks face each other, and, as the gametes become quiet, the union appears to have commenced (Fig. 10*b*). Later on the hourglass-form is reached (Fig. 10*c*), and ultimately a spherical zygosperm is the result (Fig. 10*d*).

I am unable to say whether the gametes united with an individual from the same cell or not. I could detect no difference in the size (which is about 4 $\mu$ in diam.) nor in the appearance of either gamete, and I was unable to wait for the germination of the zygosperm.

These observations were made at Swanage in June, 1892.

The median position of fertile cells has not been observed by me in any other species of *Cladophora*, and, indeed, generally the fertile cells are the uppermost ones and the condition extends downwards.

*Antheridia and spores of* **Prasiola stipitata** *Suhr.*

Mr. G. W. Traill was good enough to send me specimens of this alga collected at Joppa, near Edinburgh, in May, 1891. As they were placed at once by him in a saturated solution of sodium chloride they reached me in a condition practically the same as if just gathered. Many were in the reproductive state, and I found there were two kinds of organs, differing enormously in size, and on different plants. I proceed to give the results of a study of them.

Let us take first the large bodies which have been known some time. These are figured, though insufficiently, by the brothers Crouan (*Florule du Finistère*, Pl. ix., Gen. 68), and are the spores, the development and germination of which have been studied by Dr. Bornet (*Études Phycologiques*, p. 62).

The surface view of the frond shows the green cells irregularly round and rather closely set, but generally in groups of four, each cell in the lower part of the lamina having a diam. of 5-7 $\mu$ (Fig. 13*a*). Towards the upper part they are still in groups of

four, but are larger, and run up into an irregular and looser arrangement, the earliest stage of the formed spores, with a diam. of 10-13 $\mu$ (Fig. 13*b*). Finally, scattered loosely in the hyaline tissue of the thallus, there are the spherical spores, up to 15 $\mu$ in diam., with a distinct cell-wall (Fig. 13*c*).

A longitudinal section of the lamina shows its thickness to be 25 $\mu$ near the base, and 30 $\mu$ at the uppermost part. At a short distance above the base the elongated green cells are arranged in pairs, end to end, in a direction perpendicular to the plane of the lamina. These divide, making a row of four (Fig. 14*a*), and are rather more developed than those of the surface view in Fig. 13*a*, and the thickness of the thallus is almost completely filled by them. No further division takes place, but they enlarge until they displace themselves and are irregularly scattered and mature (Fig. 14*b*).

The plants which produce the small bodies have a similar appearance to the sporiferous ones for some distance from the base of the lamina, excepting that the surface view shows a looser texture and a less regular arrangement in groups of four (Fig. 11*a*), but this soon runs into the groupings of fours, the size being smaller (Fig. 11*b*), and yet smaller (Fig. 11*c*), until the final division is reached, always in fours, and the breaking up is shown by the minute particles in the dissolving hyaline tissue (Fig. 11*d*).

This examination of the surface, although sufficient to show that segmentation is repeated, would, however, fail to indicate the process in the interior of the thallus, which must be learnt by a comparison with a longitudinal section. The thickness of the lamina throughout is 30 $\mu$. In the lowest region the cells are in pairs, about 5 $\mu$ thick, and 9 $\mu$ long, and there is a wide hyaline border formed by the sides of the lamina (Fig. 12*a*). A little higher the pair become two transverse rows of four each, these rounded cells having a diam. of 4 $\mu$ (Fig. 12*b*). Enlarging and dividing again in three directions, so that each produces eight segments of 3 $\mu$ (Fig. 12*c*), the last stage is reached by a similar process repeated, and thus, finally, the thallus contains between its sides a row of sixteen corpuscles in eight pairs (Fig. 12*d*). These minute bodies have then a diam. of 1·5-2 $\mu$, and only one-eighth or one-tenth that of the spores (Figs. 15, 16). They are almost uncoloured, and show only a slight granulation, with no trace of a cell-wall. On the other hand the contents of the spore are very dense, vividly green, with a slight projection or two, and are enclosed in a pretty thick wall.

I think it must be concluded from the foregoing that we have in these minute bodies the male organs of *Prasiola*. Indeed, this was the suggestion of Dr. Bornet on an examination of specimens I sent him. In a sporiferous plant several pollinoids can be seen adhering to the surface, and I have observed some in a section. I

do not, however, regard this as a proof of sexual action, for both kinds of plants grow together, and collecting might produce some admixture. It would appear improbable that fecundation of the spore takes place after the formation of the cell-wall. Hence it is more likely to occur in the earlier stage (oosphere) as in Fig. 14*a*, where the surface of the thallus is very close to the chlorophyll. To demonstrate the sexual action of the pollinoids will be no easy task. I hope, however, some attempt to germinate both spores and pollinoids in similar conditions will be made. If the minute bodies fail to do so, while the spores act as usual, it will be an additional argument for the sexual character of what I venture to call pollinoids.

The male plants appeared to be slightly more yellow in tint than the female. The tessellated appearance of *Prasiola* is chiefly caused by small areas in which the division of the chlorophyll has reached a stage differing from that of others adjacent. The process is not regular from base to apex. In a section of the male plant, *e.g.*, a portion divided into eight tiers may be interposed between others with only four.

Prof. Schmitz's view that *Porphyra* and *Prasiola* should be placed near together, notwithstanding the contrast in colour, may possibly derive some confirmation from the present note.

## EXPLANATION OF PLATE 185.

*Chorda Filum* Stackh.—Figs. 1-4.

Fig. 1.—A spirally twisted plant ÷ 8. Up to *a*, unilocular sporangia are alone present; *a-b*, a few plurilocular sporangia are amongst the unilocular; *b-c*, many plurilocular with a few unilocular; *c-d*, only plurilocular are present.

„ 2.—Small portion of surface of a spiral projection with plurilocular sporangia in various stages. The smallest bodies are the ends of as yet unchanged assimilation cells. × 200.

„ 3.—Transverse section of thallus (at Fig. 1, below *c*). × 10.

„ 4.—Portion of thin trans. section. *a*, a unilocular sporangium; *b*, early stage of plurilocular sporangium; *cc*, hairs; *d*, fully mature plurilocular sporangium; *e*, almost empty ditto. The remaining bodies are assimilation cells as yet unchanged. × 400.

*Giffordia Padinæ*, sp. n.—Figs. 5-7.

Fig. 5.—A medium-sized plant × 50. *a*, two antheridia at base; *a'*, an antheridium on erect filament; *bb*, plurilocular sporangia.

„ 6.—Antheridium. × 200.

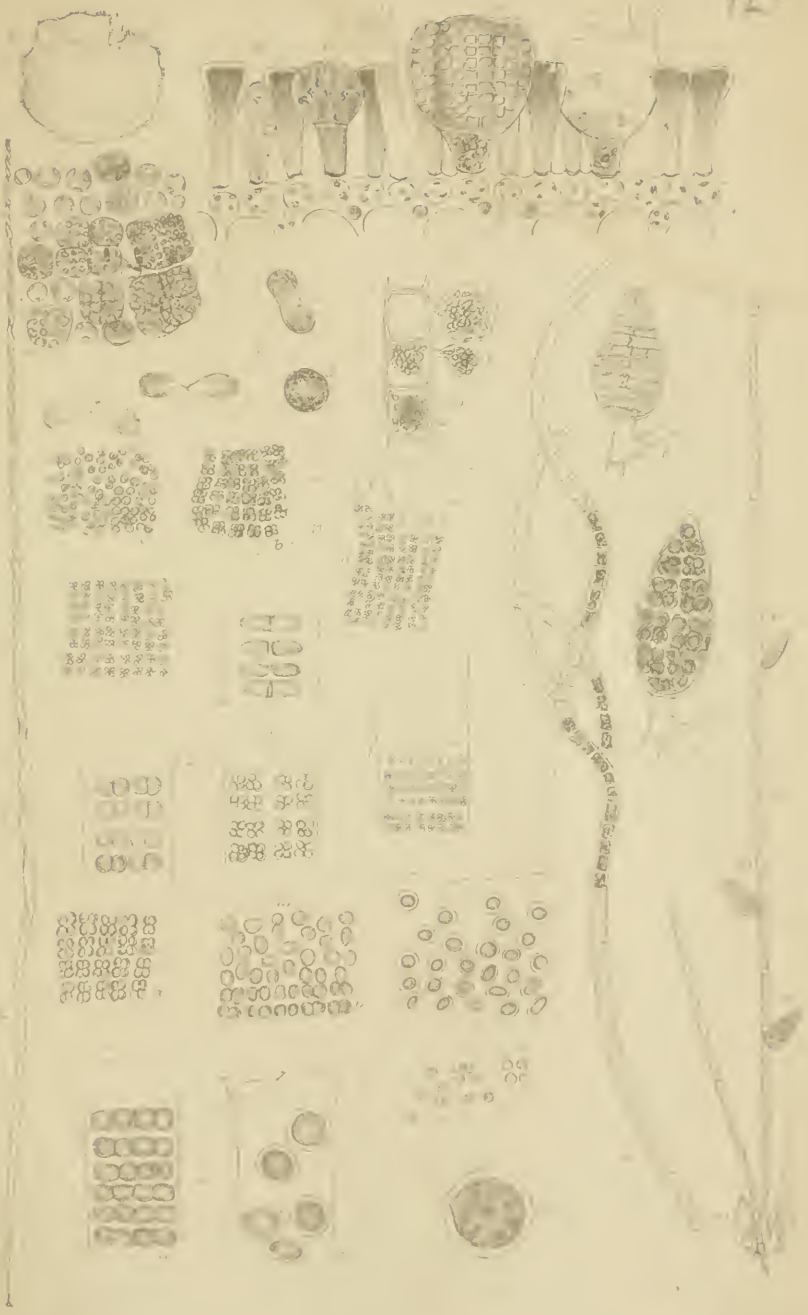
„ 7.—Plurilocular sporangium. × 200.

*Cladophora lanosa* Kütz.—Figs. 8-10.

Fig. 8.—A branched filament with fertile cells. × 50.

„ 9.—Three fertile cells. *a*, the gametes are still in the cell; *b*, they are passing out; *c*, they are in a mass of mucilage outside. × 200.

„ 10.—Conjugation of zoogametes. *a*, a pair in the act of waltzing; *b*, the union has commenced; *c*, the hourglass stage; *d*, zygosperm. × 800.



*Prasiola stipitata* Suhr—Figs. 11-16.

Fig. 11.—Surface of male plant. *a*, lower part; *b*, higher; *c*, still higher; *d*, formed pollinoids discharging. × 200.

„ 12—Longitudinal section of male plant. *a-d*, correspond to the same lettering as in Fig. 11. × 400.

„ 13.—Surface of female plant. *a*, near the lower part; *b*, the cells changing into spores; *c*, mature spores. × 200.

„ 14.—Longitudinal section of female plant. *a*, cells in transverse rows of four; *b*, mature spores scattered. × 400.

„ 15.—Free pollinoids. × 800.

„ 16.—Mature spore. × 800.

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## BIBLIOGRAPHY.

*Quelques remarques sur le genre Myriotrichia.* By Mlle. Karsakoff ("Journal de Botanique," December, 1892).

In this important paper Mlle. Karsakoff has given a most interesting account of the reproduction and development of the two common species of the genus *Myriotrichia*. The reproductive organs of Myriotrichiæ are of two kinds, as in the majority of Phæophyceæ —the plurilocular and unilocular sporangia. The latter have long been known, and are figured by Harvey in the "Phycologia Britannica," but it is only quite recently that the latter have been described. In a recent paper ("Journal of Botany," November, 1891) Mr. Buffham has given a description of the plurilocular sporangia of the two species from a morphological point of view, and this paper of Mlle. Karsakoff may be regarded as in some respects complementary to his.

In *M. filiformis* the plurilocular sporangia surround the upper part of the thallus with a thick cushion, and are small, ovoid, and sessile. The exterior cell-wall and the internal partitions are thin and transparent; the zoospores contained in the interior are coloured, have two cilia, and a red spot like the zoospores of the majority of Phæophyceæ. The sporangia are sometimes very small, shortly oval, and divided into two chambers by a transverse partition, sometimes larger, elongated, or enlarged at the base, and have three or even four rows of chambers. The two former are frequently found side by side on the same filament. The small sporangia with two rows of chambers usually contain four rather large zoospores, the others six to a dozen, usually eight, smaller zoospores. These zoospores escape from the sporangia by either a terminal or lateral opening.

In *M. clavæformis* the plurilocular sporangia are usually conical, with three or four rows of chambers. Some of these sporangia contain eight zoospores (sometimes six or seven), which escape from the sporangia one after the other, either through a single terminal opening or through a terminal and a lateral opening;

others contain from 10-32 (usually 16) zoospores, about two-thirds the size of those eight only of which are contained in a single sporangium. Mlle. Karsakoff states that in *Myriotrichia* conjugation takes place while both gametes are still actively motile, or at the instant they come to rest, but that perhaps the latter case is the rule. The process of conjugation is thus described by the authoress :—For two or three hours the liberated gametes, large and small, swim about in all directions. Little by little they begin to lose the power of motion, and approach one another in pairs, the large zoospores pairing with the little. They then roll one over the other, their hyaline portions come in contact, and little by little they combine, the larger zoospore appearing to absorb the contents of the less. After an hour or an hour and a half one sees that the two have united, to form a single coloured spore, with two red spots, which is larger than either of the zoospores which went to form it, taken singly. If the zoospores do not conjugate it appears doubtful, although they are capable of germinating, whether the plantules arising from them ever come to maturity.

The unilocular sporangia of both species are spherical or ovoid, and contain an innumerable number of zoospores, about half the size of the smaller zoospores from the plurilocular sporangia.

Under ordinary circumstances both *M. filiformis* and *M. clavæformis* are attached by horizontal creeping filaments spreading over the substratum, and strengthened by numerous rhizoids descending the lower articulations of the upright filaments. Together the creeping filaments and rhizoids form a dense cone or disc. When, however, these two plants grow on algæ, which have a soft, velvety cortication, the case is different, and the horizontal filaments creep for a considerable distance, the rhizoids forcing their way into the tissues of the host plant. In cases of this kind it sometimes happens that the unilocular sporangia are borne on the horizontal filaments. Mlle. Karsakoff points out that this being the case it is needless to retain the genus *Dichosporangium*, of Hauck, which was separated from *Myriotrichia* because the sporangia were borne on the creeping as well as on the upright filaments. Mlle. Karsakoff's paper is accompanied by an excellent plate.

*Les Algues de P. K. A. Schousboe.* By E. Bornet. (" Mem. Soc. Nat. Sc. de Cherbourg," Vol. xxviii., 1892.)

In a volume full of interest from beginning to end Dr. Bornet has given an account of the Algæ collected by P. Schousboe, between the years 1815 and 1829, in Morocco and along the coast of the Mediterranean. Many new species are described in this volume, and notes of the greatest value and interest to algologists are appended to a large majority of the species mentioned. The geographical distribution of the species is also given, and the volume is illustrated by three very beautiful plates. Among the

most interesting of the new species may be mentioned *Phormidium moniliforme*, Gomont, a plant which is said to be found in Scotland. The trichomata are only 1·8 to 2·2 $\mu$ in diameter, and form a gelatinous mass over the filaments of *Chætomorpha*.

*Ulva Schousboei*, Bornet, a species presenting the exterior appearance of a Letterstedtia.

*Enteromorpha micrococca*, Kütz., var. *polyopa*, Bornet, which resembles *U. reticulata* in possessing a net-work of filaments.

*Nemoderma tingitana*, Schousb.—A most extraordinary alga, belonging to the Phæophyceæ, but differing from all other phæophyceæ in its fructification. Its reproductive organs are of three kinds, which Dr. Bornet has provisionally called plurilocular sporangia, antheridia, and unilocular sporangia; but, of course, their real characters can only be determined from the living plant. The plurilocular sporangia and antheridia are scattered together through the whole thallus. The plurilocular sporangia are siliquiform, and are formed by the transformation of a multicellular branch, the superimposed articulations of which swell and divide by vertical partitions into numerous cellules. The antheridia greatly resemble those of *Polysiphonia*, but differ from them altogether in their mode of development. The unilocular sporangia are rarer than either of the other forms of reproductive organs; they are formed by the enlargement of an intercalary articulation of an erect filament into an ovoid sac.

*Rhodochæte pulchella*, Thuret.—An alga resembling an *Acrochætium* in appearance, but differing from that genus in the formation of the spores which are formed in the continuity of the filaments, like those of *Erythrotrichia*.

*Flahaultia appendiculata*, Bornet.—In the genus *Flahaultia* the central portion of the frond is occupied by a loose layer of articulated branching filaments, on either side of which are several layers of oblong or roundish cells, which diminish in size towards the periphery, which is composed of a layer of small coloured cells, arranged vertically. The cystocarps, immersed in the tissue of the frond, are prominent on its surface, more so, however, on the side where the pericarp opens. The nucleus is formed by a reticulated lacunose, lobed placenta, composed of anastomosing cellules, around which radiate the sporiferous filaments.

*Nitophyllum ciliatum* (Schousb.), Born.—An alga resembling *N. pulchellum* and *punctatum* in general appearance and the entire absence of veins, but differing from both in having the margins of the frond ciliated, and tetrasporic sori occupying the centre of the frond. Cystocarps scattered.

*N. dentatum* (Schousb.), Bornet.—An interesting species belonging to the section *Dawsonia*, of which all the species at present known, with this solitary exception, come from either Australia or New Zealand.

*Spermothamnion capitatum*, Bornet.—In many respects this plant

resembles *Spermothamnion flabellatum*, from which, however, it is sharply separated by the tetraspores, being replaced by large globular sporangia, containing a large number of spores, even as many as 60.

*Antithamnion pteroton*, Bornet.—A very small species, resembling *C. pluma* and *elegans*, but more delicate, and of a more distinctly rose colour. It is easily distinguished from either of these, however, by its pinnules when well developed being pectinate, and by its cruciate tetraspores.

*Revision von Jürgen's Algæ Aquaticæ.* By Th. Reinbold. ("Nuova Notarisia.")

Major Reinbold has performed a much-needed and useful work in revising Jürgen's "Algæ Aquaticæ." This collection of exsiccata was published between the years 1818 and 1824, consequently the nomenclature used by the author is very different from that at present in use, but no very startling results have been attained by this revision. Major Reinbold, however, considers that Merten's *Conferva torta*, specimens of which are contained in Jürgen's collection, are identical with *Enteromorpha percursa*, Harv., and var. γ of J. Agardh's species of the same name. He has consequently renamed this species *Enteromorpha torta*, and at the end of his paper gives a long and interesting account of its synonymy.

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## LICHENES.

M. P. Hariot (Bull. Soc. Myc., France, vii., p. 32) has shown that the genus *Dictyonema* is a true lichen. The fungal element belongs to the Hypochnaceæ, and nearest to the genus *Coniophora*, its basidia bearing four spores; the alga is a species of *Scytonema*.

The species of *Dictyonema* resemble those of *Stereum* in habit; the inferior surface when fully evolved consists of a continuous layer of basidia—hymenium—the upper surface being of a spongy texture and green colour.

*Dictyonema sericeum*, Johow., has been collected in Scotland and Wales, and is figured in Eng. Bot., pl. 2954, as *Rhizonema interruptum* (Carm.), Thwaites, and reproduced in Cooke's "British Fresh-Water Algæ" as *Scytonema interruptum*, Thw.

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No. 100. June, 1893.

# Grevillea.

A QUARTERLY RECORD OF CRYPTOGAMIC BOTANY AND ITS LITERATURE.

## ALGÆ.

### New or Critical British Algæ.

By E. A. L. Batters, B.A., LL.B., F.L.S.

**Cladophora Crouani**, *Kütz. Tab. Phyc.* III., *tab.* 100.

This species forms large entangled bunches loosely lying on the bottom of the sea. The filaments are moderately rigid, from 100-200 $\mu$ in diameter. The branches short, scattered, lateral, subsecund, rarely opposite. The older portion of the principal branches and branchlets frequently naked for long distances; joints from $1\frac{1}{2}$-3 times longer than their diameter.

I dredged this interesting species, or variety, from 4-5 fathom-water in Lamlash Bay, Arran, last August. It formed intricately entangled bundles of a clear grass-green colour, which appeared to have been lying unattached on the bottom. The tufts are with difficulty disentangled, and then the filaments are seen to be branched in a very irregular manner between dichotomous, alternate and opposite, the branches spreading at very wide angles and bent at intervals in a zigzag manner, long distances of the main filaments being naked, the ultimate branchlets short and usually opposite. In his "Species Algarum," Kützing speaks of Chauvin's *Conferva Crouani* as a variety (*β. horrida*) of *Cladophora rectangularis*, Griff., but in the "Tabulæ Phycologicæ" he once more raises it to specific rank as *Clad. Crouani*. Most authors have regarded the plant as only a deep-water form of *C. rectangularis*, but, judging from my specimens, the habit of the two plants is very different, *C. Crouani*, as Kützing remarks, more resembling Harvey's *Clad. Macallana*, from which it differs in the ultimate branchlets being frequently opposite.

**Haplospora globosa**, *Kjellm.*

This plant is thus described by Kjellman in his "Bidrag till Kännedomen om Skandinaviens Ectocarpeer och Tilopterider," *Haplospora*. Thallus brown, filiform, branched on all sides, more or less polysiphonous below, monosiphonous above. Sporangia

unicellular, quite external, each sporangium containing a single spore. Mature spores provided with two thin coverings. *Haplospora globosa :* Thallus attached by fibres, dark-brown, turning oblive-green in drying, decompoundly branched, branches and branchlets opposite, alternate, subsecund or scattered. Sporangia globose or subglobose, 85-114 (usually 90) $\mu$ in diameter, sessile or shortly stalked, each spore completely filling its sporangium. Antheridia, 50-79 $\mu$ long, 30-45 $\mu$ wide.

We are indebted to Mr. G. Brebner, who has for some time past been successfully studying the marine algæ of the Clyde sea-area, for this very interesting addition to our marine flora, which he gathered near the Lion rock, Cumbræ. The plant was sent to us for identification with a note stating that Mr. Brebner had observed as many as four nuclei in a single spore ; this is of interest as confirming Reinke's observations. As will be seen from the diagnosis given above, Kjellman found bodies which, at one time, he regarded as antheridia ; Reinke, however, in his very valuable paper, "Ein fragment aus der Naturgeschichte der Tilopterideen" ("Botanischen Zeitung," 1889, No. 7, p. 9), remarks: "I have thoroughly examined hundreds of examples of *Haplospora globosa* from various localities and collected at different seasons, but have never found on them other reproductive organs than the sporangia already described, each containing a large round spore with four or more nuclei. This spore, however, is certainly produced asexually, and, moreover, it germinates without any sort of sexual contact. I, therefore, have no hesitation in declaring *Haplospora globosa* an altogether asexual plant."

We most heartily congratulate Mr. Brebner on his "happy find," and trust that his further investigations will result in the discovery of *Scaphospora speciosa*, Kjellm., which usually grows in company with *Haplospora globosa*, and many other species which have not yet been recorded from our shores. We may mention that Mr. Brebner has also sent us for identification a beautiful specimen of *Ectocarpus tomentosoides*, the discovery of which, as a British plant, was recently recorded in this journal (Vol. xxi, p. 20). We have also seen specimens of the same species gathered by Miss Barton, near Howth, Ireland.

**Pylaiella varia**, *Kjellm.*

Mr. Holmes, in an interesting paper in the "Annals of Scottish Natural History" (April, 1893), records the occurrence of this species in Scotland. It was gathered last year in Cromarty Firth, by Mrs. Farquharson, of Meigle, and forwarded to Mr. Holmes for identification.

This alga forms loosely entangled mats of a dark olive-brown colour, lying free on the bottom or hanging on other algæ. The fronds are decompoundly branched, the branches spreading at a wide angle; the ultimate branches are very short and patent. The short branches, consisting of 2-10 cells, are frequently

terminated by a solitary sporangium. The unilocular sporangia are terminal, frequently solitary, but chains of 2-12 are sometimes found side by side with the solitary ones.

Dr. P. Kuckuck considers this plant a sub-species of *Pylaiella (Ectocarpus) litoralis;* M. Foslie, on the other hand, considers it a good species, which should be called *P. compacta*, as being identical with the old *P. litoralis f. compacta.* M. Foslie remarks of it: "On the other hand, *P. litoralis f. compacta* differs so much from the typical form of the species that it, as far as I have seen, deserves to be kept distinct. It is separated as to the habit, and, above all, by its ramification and solitary or short chains of sporangia, which are sometimes divided into two daughter-cells. I regard *P. varia* as a form of the species. It seems to possess a number of forms almost similar to that of *P. litoralis.*" In the paper above referred to, Mr. Holmes says: "The limit of a species doubtless forms a very vexed question, but it seems desirable, for the sake of convenience, that when two plants differ in habit and mode of growth and development, so much as do *P. litoralis* and *P. varia*, and retain their characteristics in different countries, they should be kept distinct, as, for example, is done in the *Rubi*, *Salices*, and *Hieracia*, amongst Phanerogams. If Dr. Kuckuck's plan were followed, there would be little reason for holding *Ectocarpus distortus* and *Ectocarpus Landsburgii* distinct from *Ectocarpus tomentosus*, Lyngb. The plurilocular fruits borne on specimens of *E. Landsburgii*, sent me by Mr. D. Robertson, of Cumbrae, and those of *E. distortus*, collected by myself at Fairlie, in Ayrshire, show so great a resemblance to those of *E. tomentosus* that I see no reason why they should not both be considered as sub-species of that plant, more especially as the differences in ramification and in the size of the zoosporangia are not greater than exist between *P. litoralis* and *P. varia.* A careful search on the West Coast of Scotland would, doubtless, reveal an intermediate series of forms connecting the three plants, *Ect. tomentosus*, *E. distortus*, and *E. Landsburgii.*"

We cannot agree with Mr. Holmes in considering *E. tomentosus* nearly related to *E. distortus.* We have had ample opportunity of studying both species, and believe them to be as different from each other as any two species need be. The large, dense tufts, 4-8 inches or more long, of *E. distortus* are of a dark chestnut-brown, and bear no resemblance to the light-coloured, rope-like, spongy masses, irregularly much-branched, of *E. tomentosus.* In the former species, moreover, the filaments vary in diameter from 40-60 $\mu$, the average width of the principal branches being 50 $\mu$, while those of the latter are from 8-12 $\mu$ broad. The plurilocular sporangia of *Ect. distortus* are ovate-acute, slightly truncated, while those of *E. tomentosus* are linear-oblong, straight or incurved.

*Ect. distortus* appears to us to be very nearly related to *Pylaiella varia*, and we rather fancy Mr. Holmes must, through inadvertence, have written *E. tomentosus* for *E. varius.* A glance at the figures

given by Kjellman of his *P. varia* and by Harvey of *E. distortus* will show how nearly the ramification of the two plants agrees. The filaments of the two are also almost of the same diameter, and were it not that we have never seen any chains of unilocular sporangia on *E. distortus*, we should feel inclined to unite the two species. The plurilocular sporangia of *P. varia* are, according to Dr. Kuckuck, "irregular in their form, globular, ovate, or ellipsoidal, or of more angular outline to nearly cuboidal, blunt or obliquely truncated, never lengthened into a sharp point, mostly solitary on short stalks, never sessile, situate on the branches of all orders; shorter or longer intercalary plurilocular sporangia abundant on many examples." The unilocular are "globular to ellipsoidal, mostly solitary, on a single or few-celled stalk, never sessile, or several together lateral and terminal on sparsely branched short ramuli, seldom united into short chains, situate on the branches of all orders." In both *E. distortus* and *E. Landsburgii* the sporangia of both kinds are, in all the specimens we have examined, terminal, *never* intercalary. Most likely *E. Landsburgii* is only a deep-water form of *E. distortus*, but we think it is premature to unite either one or other of them to *Pylaiella compacta*, Foslie, or *P. litoralis*, Kjellm. Of course, the specific name "*distortus*" has the priority of publication over that of "*varius*."

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## Bibliography.

*A New African Laminaria* (Bulletin de l'Herbier. Boissier, Vol. I., No. 2. February, 1893).

M. Foslie has received from Dr. Hans Schinz, of Zürich, a new Laminaria (*L. Schinzii*, Foslie) gathered in October, 1890, in Walfisch Bay, from a depth of 3 m.

The diagnosis of the new species is as follows:—L. perennial root fibrous; root-fibres branched, attenuated; stipe round, solid above and below, hollow in the middle, up to 2-5 c.m. in diameter, attenuated at both ends; a transverse section shows muciparous lacunæ more or less regularly arranged in the intra-cortical layer; lamina often elongated, cordate or cuneiform at the base, deeply split into from 5-19 segments, 1-5 to 6-5 c.m. wide, coriaceo-membranaceous; sori forming dispersed patches on the upper part of the segments, of various shapes and sizes, 62-74 $\mu$ wide; zoosporangia subcylindrical, 36-50 $\mu$ long, 7-10 $\mu$ wide; paraphyses elongated, wedge-shaped.

f. **typica**, *Foslie.*

Stipe longer, lamina ovate or cordate.

f. **cuneata**, *Foslie.*

Stipe shorter, lamina lanceolate, longer and narrower than in the preceding variety. The specimens examined appeared to be young.

This paper is illustrated by a pretty plate.

*List of the Marine Algæ of the Isle of Wight.* By M. Foslie. (Det. Kgl. Norske Videnskabers Selskab Skrifter.)

Some years ago M. Foslie collected marine algæ during December, January, and a part of February, at different places in the Isle of Wight, especially at Ventnor and Steephill Bay, and in the present paper he gives us the results of his investigations. The list is mainly a reprint of Parkinson's "The Marine Algæ (seaweeds) of the Isle of Wight," which was based on A. Hamborough's list of the Algæ in Canon Venables's "Guide to the Isle of Wight, 1860." The additions to Hamborough's list are not numerous or very important, but we were not prepared to find *Euthora cristata* amongst them. In the preface M. Foslie remarks: "It is specially noted when any of the specimens found were provided with any kind of reproductive organs," so that as no remark is added to the record of *Euthora cristata f. augustata*, we presume the specimen was barren, and suspect that it may turn out after all to be a very narrow form of *Sphærococcus coronopifolius*, which we have often seen mistaken for *Euthora*. This is the more probable from the fact that with us *Euthora* appears to be a summer annual, and even in the South of Scotland has quite disappeared by the end of September, while M. Foslie's specimen was gathered in the South of England in December or January. So far as I am aware, *Euthora* has never been found on the English coast farther south than Cullercoats.

Another of the additional species *Phyllitis filiformis*, Batt, has the following note appended to it:—"I collected an alga at Alum, Bay, which on the one hand reminds one of *Ph. Zosterifolia*, Rke., but on the other hand seems to be so nearly related to *Ph. filiformis*, Batt., that any limit hardly may be drawn. The plant grew gregarious in rather large numbers on sand-covered stones in the lower part of the litoral region. It is 4-6 c.m. long, 80-250 $\mu$ broad, and the thickness in proportion to the breadth as 1-3 or 1-4, and rises from fibrous rootlets. Specimens collected in the middle of February were sterile. If it, as to the organs of reproduction, proves to correspond with *Ph. filiformis*, the latter probably at most is to be regarded as a form of *P. zosterifolia*. It may be remarked that also other species growing in certain localities rise from fibrous rootlets or develop rhizoids instead of a typical disc-like base." We do not think that M. Foslie's plant is really *Ph. filiformis*, which may readily be distinguished in the barren state from other species of *Phyllitis* by the cortical cells being arranged in regular longitudinal rows, while they are irregularly placed in *Ph. zosterifolia*, etc. Moreover, *Ph. filiformis*, so far as we have observed it, is always in fruit in February, by the end of which month but very few specimens remain; it also grows at high-water mark, not in the "lower part of the litoral region," and is cæspitose in habit.

In compiling his list Mr. Parkinson rejected some of Ham-

borough's records, we think, on insufficient evidence. He remarks: Mr. A. Hamborough names several other species (of *Polysiphonia*) from the Isle of Wight, some I think scarcely more than varieties of the above species; the following are the rejected species with the localities given by Hamborough :—*P. fruticulosa*, Steephill; *P. formosa*, St. Lawrence; *P. fibrillosa*, St. Lawrence; *P. pulvinata*, Steephill; *P. fibrata*, Steephill. Certainly *P. formosa* may be a variety of *P. urceolata*, but the others are surely good species. Several other species mentioned by Hamborough are omitted, without note; *e.g.*, *Corallina rubens f. corniculata*, Steephill; *Lithophyllum lichenoides*, Brook Ledge; *Antithamnion plumula*, West Cowes; *Pleonosporium Borreri*, Niton; *Callithamnion tetragonum f. brachiata*, St. Lawrence; *Nitophyllum uncinatum*, West Cowes; *Rhodymenia palmetta*, Sandown; *Fucus ceranoides*, Medina River; *Porphyra linearis*, Steephill; *Castagnea Griffithsiana; Asperococcus echinatus f. vermicularis*, Steephill; *Monostroma Grevillii* (subnom. *Ent. cornucopiæ*), Niton; *Cladophora albida; Lyngbya majuscula*, Gurnet Bay; *Calothrix confervicola*, West Cowes. We have had the opportunity of examining a collection of Marine Algæ from the Isle of Wight, formed by Count Eugène Poutiatine, and in it were the following species not previously recorded from that locality :—*Choreocolax Polysiphoniæ*, Sea View; *Myrionema strangulans*, Shanklin; *Elachista stellaris f. Chordæ*, Shanklin; and *Giraudia sphacelarioides*, Shanklin.

*Algological Notices.* By M. Foslie (Det. Kgl. Norske Videnskabers Selskab Skrifter.)

Under the above title M. Foslie gives some short notes on *Pelvetia canaliculata*, *Ralfsia pusilla* and *Haplospora globosa*?

Speaking of *Ralfsia clavata*, he says: "I agree with Batters, Mar. Alg. Berwick-on-Tweed, p. 67, in regarding *Stragularia* only as a subgenus of *Ralfsia*, but not referring *R. Clavata* (and *R. Spongiocarpa*?) to the former, as the filaments not seldom are curved, and the sori, so far as known, never confluent. Cp. Rke. l.c." With regard to this we would call M. Foslie's attention to the fact that the genus *Stragularia* was specially formed by Strömfelt (om Algvegetationen vid Islands Kuster p. 49) for the reception of this very species *Ralfsia clavata*. In *R. clavata*, too, the fructification is rather uniformly diffused over the frond, the whole central portion being often composed of the confluent sori. We may remark further that *Stragularia pusilla* had been removed to the genus Ralfsia some months before the appearance of M. Foslie's paper (*vide* Journal of Botany, June, 1892).

*Propagation of Prasiola* (Ber. Deutsch. Bot. Gesell., 1892, p.p. 366-374).

Prof. G. V. Lagerheim's discovery of a second mode of reproduction presenting strong analogies with the formation of tetraspores in the genus Prasiola, coupled with M. Bufiham's equally interest-

ing discovery of antheridia in the same genus, certainly strengthens the argument in favour of the alliance of the genus with the Bangiaceæ. In a new variety of *P. Mexicana*, Prof. Lagerheim has noted in addition to the usual mode of reproduction a second mode in which the monostromatic frond becomes divided by horizontal and vertical walls into one or two layers of four-celled sporangia. These four-cells are freed by the dissolution of the mother-cell, and are motionless spores of irregular, roundish, rectangular or triangular form. Prof. Lagerheim has also observed pyrenoids in the vegetative cells of *Prasiola*.

*Parasites on Algæ*. By Geo. Murray. ("Natural Science," Vol. ii., Feb., 1893.)

Mr. Geo. Murray contributes an interesting paper on the parasites on Algæ to the February part of "Natural Science." Beginning with animal parasites the author mentions the so-called "galls" on *Vaucheriæ*, first described and figured by Vaucher, in 1803, caused by the attacks of an animal which at various times has been identified as *Cyclops lupula*, *Notommata Werneckii*, or *Rotifer vulgaris*. The malformations of the thallus of *Rhodymenia palmata*, caused by the copepod *Harpacticus chelifer*, which during a stage of its existence burrows in the tissues of the *Rhodymenia*, those of *Desmarestia aculeata*, also caused by a copepod, and those of *Ascophyllum nodosum*, caused by a nematode worm *Tylenchus fucicola*, all of which were first described by Miss Barton, are next dealt with.

Passing from animal to vegetable parasites, mention is made of Chytridia—plants belonging to an aberrant type of fungi—several species of which inhabit fresh water and marine Algæ. On our own coasts *Chytridium tumefaciens* is commonly to be met with on species of Ceramium, *Ch. sphacelarum* on Sphacelariæ and Cladostephi, and *Ch. plumulæ* on *Antithamnia*. Mention is made of papers by Braun, Bail, Cienkowski, Cohn, Magnus, King, Perceval Wright, Pfitzer, and Zopf dealing with this interesting group of fungi.

Of Algal parasites Chlorochytrium and Phyllosiphon are alone mentioned. Finally mention is made of the tubercules on the fronds of Florideæ, described by Dr. Schmitz as caused by Bacteria.

The paper may be said to deal exclusively with parasites other than Algæ, and we trust that before long Mr. Murray will give us a continuation, dealing with this most interesting portion of the subject. To go no further than our own coasts many most interesting parasitic Algæ are not uncommon at many stations along our shores, for instance, *Chlorochytrium immersum*, inhabiting the fronds of Schizonemata, *Ch. inclusum* those of Dilseæ, *Ch. dermacotolax* those of Polysiphoniæ and Polyides, *Cholocystis Cohnii* those of Schizonemata and Polysiphoniæ, *Entoderma viridis* those of Nitophylla, *Ent. Wittrockii* those of Ectocarpi, and

*Phœophila floridearum* those of Rodymeniæ, and other Florideæ are examples of parasitic *Chlorophyceæ*, which, perhaps, extort nothing beyond lodging from their hosts. Amongst the Phæophyceæ, however, the case of some Ectocarpi, Elachisteæ, and Litosiphones is rather different, for here, while the principal portion of the plant is quite external, rootlets are sent deep down into the tissues of the host-plant, in some instances distorting them and forming a "gall." Of plants of this kind we have in Britain *Ectocarpus brevis* on Ascophylla, *Ectocarpus luteolus* on Fuci, *Ect. minimus* on Himanthaliæ, *Ect. parasiticus* on Ceramia and Cystoclonia, *Ect. investiens* on Gracilariæ, *Ect. velutinus* on Himanthaliæ, *Myriactis stellulata* on Dictyotæ, *Litosiphon laminariæ* on Alariæ, etc., while amongst Algæ which have not yet been detected on our shores, but which may be confidently expected to occur, we may mention as of especial interest *Ectocarpus valiantei* and *Streblonemopsis irritans*, which form together with the distorted cells of the host-plant gall-like excrescences on Cystosiræ; and *Ect. solitarius* on Taoniæ. Amongst the Florideæ true parasites are not uncommon; we may instance *Choreocolax polysiphoniæ* living in the tissues of Polysiphoniæ and causing gall-like excrescences on their fronds, *Harveyella mirabilis*, causing similar galls on Rhodomelæ, *Actinococcus roseus* on Phyllophora, *Gonimophyllum Buffhami* on Nitophylla and *Choreonema Thuretii* on Corallinæ, while *Schmitziella endophloea* may be taken as an example of one of the endophytic Florideæ, probably seeking only lodging from its host *Cladophora pellucida*. The above list is sufficient to show how numerous are both semi and truly parasitic Algæ.

*Notes on Scotch Fresh-Water Algæ.* By W. West. ("Journal of Botany," April, 1893.)

Mr. West gives us in this paper a list of some 216 species and varieties of fresh-water Algæ, partly gathered by himself during a short botanical tour about some of the mountains of Scotland, in July, 1889, and partly by Mr. Naylor in the Orkneys. The paper is illustrated by an excellent plate drawn by the author's son. The following new species and varieties are described :—

**Œdogonium Itzigsohnii,** *De Bary*; var. **minor,** *West.*

Var cum cellulis augustioribus et oosporis minoribus. Crass. cell. veget. 6-6·5 $\mu$; altit. 8-10 plo. major; crass. oogon. 30 $\mu$; altit. 28-30 $\mu$; crass. oospor. 18-20 $\mu$; altit. 18-20 $\mu$. Orkney Islands.

**Oocystis apiculata,** *West.*

O. in familas e 2-4 cellulis formatas consociatis, oblongis, diametro duplo longius, subapiculatis et incrassatis ad unumquemque polum. Long. cell. 11-15 $\mu$; lat. cell. 5-6 $\mu$; diam., fam. 2-cell., 22-24 $\mu$. Orkney Islands.

**Trochiscia paucispinosa**, *West.*

*T. parva*, cellulis solitariis vel in familiis parvis associatis, subglobosis vel leve sub-angularibus ; membrana cellularum crassa, aciculis brevibus paucis (peripherici 7-14) ornata. Diam. sine acul. 15-17 $\mu$ ; diam. cum acul. 18-20 $\mu$ ; crass. memb. 1·5-2 $\mu$. Ben Lawers.

*Analecta Algologica. Observationes de speciebus Algarum minus cognitis earumque dispositione.* By J. G. Agardh.

Under this title Dr. J. G. Agardh has issued a reprint of Algological papers originally published in the " Acta. Soc. Physiograph. Lund.," tom. xxviii., and which in form and character may be considered a second series, under another title, of the " Till Algernes Syst." recently concluded. The untiring industry of the veteran Algologist, as manifested in his continuous and laborious publications, is simply marvellous, and the readiness with which, aided by the light thrown by the discovery of new species on existing genera, he discards old views and accepts new facts, increases the faith with which his opinions are accepted all over the world.

The natural orders of Algæ dealt with in the present treatise include the Cryptonemiaceæ, Gigartinaceæ, Rhodymeniaceæ, Sphærococcoidiæ, Chætangiaceæ, Hypneaceæ, Solieriaceæ, Wrangeliaceæ, and Rhodomelaceæ; a number of new genera and species are described and their position is indicated by numbers corresponding to those used for the genera in the " Epicrisis Floridearum." Commencing with the Ceramiaceæ he divides the genera of the Callithamnieæ into two sections according to the character of the stem. In the first decurrent threads are found *inside* the cuticle near the base of the stem, and in the second the threads are external to the cuticle, and extend for some distance. The sub-divisions of these sections are distinguished by the nature of the tetraspores, whether cruciate, tripartite, or polysporic.

Dr. Agardh retains as distinct genera Rodochorton, Antithamnion, Ptilothamnion, Plenosporium, and Halothamnion, and confines the genus *Callithamnion* to plants having tripartite tetraspores, and favellæ naked from the beginning, with nuclei in pairs or many-lobed, the branching being either pinnate, di- or trichotomous or alternate, and the stems having no external fibres. *Callithamnion interruptum* is placed in a new genus—Microthamnion—near Rhodochorton, on account of its cruciate tetraspores, a position which seems somewhat unnatural. The favellæ, however, being unknown, its true position is doubtless difficult to assign. Antithamnion is made to include eight species, *Ptilota* (*?*) *Hannafordi*, Harvey, being among the number. The new genera are Platythamnion (*C. heteromorphum*, J. Ag.), Acrothamnion (*C. pulchellum*, Harv.), Heterothamnion (*C. Muelleri*, Sond.), Gymnothamnion (*C. elegans*), Perithamnion (*P. ceramioides*, n. sp. ; *P. arbuscula*, n. sp., both from Australia, and *P. Myurum*=

*C. Myurum*, Suhr.), Ceratothamnion (*C. Pikeanum*, Harv.), Lophothamnion (*L. comatum*, n. sp., from Australia), and Aristothamnion (*C. purpuriferum*, J. Ag.).

*C. Vancouverianum* is referred to Pleonosporium, and *C. Dasyoides* to Halothamnion. *Spongoclomium*, Sond., receives a new Australian species, *C. Wilsonianum;* Dr. Agardh removes Acrochætium, Spermothamnion, and Lejolisia from the Callithamnieæ.

In the Cryptonemiacæ four new species are added to the genus Halymenia, and in the Gigartineæ one species—*I. Australica*—to the genus Iridæa.

Considerable alteration has been made in the genus Kallymenia, owing to the examination of a better series of fruiting specimens than was previously possible. A new section—Meristea—is formed to receive *K. rosacea* and *K. demissa*, n. sp., both characterized by prominent hemispherical cystocarps and lobed and laciniate fronds. *K. phyllophora* and *Cryptonemia Wilsonis* are now placed together in a new genus Blastophye, allied to Kallymenia, but with decompound fronds and cystocarps, with an open carpostome. *Kallymenia microphylla*, J. Ag., is now placed in a new genus—Meredithia—while the Mediterranean, *K. microphylla*, Zan., is retained in Kallymenia, Dr. Agardh considering that his *Meredithia microphylla* differs from Zanardini's plant in the exserted apothecia-like cystocarps, the tougher and less gelantinous consistence of the frond, and the pluriseriate cortical cells. Two other species, *M. nana*, n. sp., and *M. polycœlioides* (= *K. polycœlioides*, J. Ag. Epicrisis) are also placed in the genus Meredithia. The new genus, Hormophora, is also allied to Kallymenia, but differs in its exserted cystocarps and fastigiate, branched and moniliform frond, only one species, *H. Australica*, being described. A Californian plant, having a singular resemblance, both in structure of frond and in external appearance, to narrow forms of *Rhodymenia palmata*, but the fruit of which more nearly resembles that of Callophyllis, is placed in a new genus Ozophora, near the last-named genus. It is characterized further by the cystocarps occuring in small erect, incurved ligules, aggregated in the middle or near the margin of the fronds. To the genus Hymenocladia one new species, *H. filiformis*, from Australia, is added. Under *Gloiosaccion* a new species from the same country, *G. pumilum*, is described ; *Halosaccion hydrophora*, Harv., and *H. Brownii*, Harv., being likewise placed there. The genus Chrysymenia has also undergone some modifications. The section Leptosomia has been raised to generic rank, and now includes *Ch. Cliftoni* and *Ch. gelatinosa*, whilst *C. planifrons* is removed to the section Cryptarachne, and one new species, *C. Dickieana*, from Bahia, has been added. To the genus Plocamium one new species, *P. Sandvicense*, intermediate in character between *P. Telfairiæ* and *P. augustum*, is added.

An interesting plant from California, the position of which, owing to the tetraspores being unknown, cannot be satisfactorily

determined, is described under the name of *Leptoctadia Binghamiæ*. It has narrow, serrated fronds, with the aspect of Hymenocladia, but the structure of the cystocarpic fruit resembles that of Rhodymenia. Another puzzling plant, with a filiform frond, and having the habit of Callithamnion, but a structure resembling that of Rhodophyllis, is described under the name *Erythronæma ceramioides*. It is an Australian species, collected by that keen-eyed algologist, M. J. B. Wilson. By the same collector a new species —*S. marginata*—has been added to the genus Sarcodia. It comes very near to *S. Montagneana*, but differs in having the cystocarps confined to the margin.

A new species of Stenocladia, *S. ramulosa*, from Australia, is described as being a stouter plant than *S. furcata*, and having more corymbose branches.

A plant, allied to this genus in structure, but of which the fruit is unknown, is placed in a new genus, Amylophora, in allusion to the great abundance of starchy granules in the frond. A curious case of the mimicry not unfrequent in Marine Algæ, occurs in the new genus Peltasta, which might easily be mistaken for *Acrotylus*, both from its outward form and from the arrangement of its tetraspores. The interior structure, however, is totally different, consisting of rounded, angular cells, arranged like those of Rhodophyllis. The only species known is named *P. australis*.

An Australian plant, *A. hymenocladioides*, which forms the type of the new genus Amphiplexia, in the Desmiospermeæ, is placed by the author near Hennedya, on account of its exserted cystocarp.

The genus Rhabdonia has undergone revision, and two new species have been added. One of these, *R. compressa*, from Tasmania, is remarkable for bearing so strong a likeness to *Gracilaria compressa*, that if collected in Europe it would pass for that plant, from which the structure of the frond and the zonate tetraspores at once distinguish it. The other species from Australia appears to be intermediate in character between *R. mollis* and *R. hamata*.

The genus Eucheuma has likewise been passed in review, and a new species—*E. jugatum*—allied to *E. serra*, but with the primary spines verticillate, has been added. To this genus is also referred *Mychodea Schrammi*, Crn. To the genus Lejolisia, a new species, *L. ægagropila* (= *Callithamnion ægagropila*, J. Ag. Epicris), is now added.

In revising the Rhodomeleæ, Dr. Agardh retains all the genera therein included in his "Species Algarum," with the exception of Martensia, nothwithstanding the opinion of Falkenberg, as expressed in "Bot. Zeit.," 1881, p. 164. The constitution of the different tribes is, however, somewhat altered, Digenia being removed to the Chondriopsideæ, and a new tribe, Rhodomeleæ, being made to include Rhodomela, Trigenea, and Odonthalia. The tribe Alsideæ is omitted. Alsidium and the other remaining genera, with the exception of Bostrychia, which now comes in

Poyzonieæ, being included in the tribe Polysiphonieæ. A new tribe, Amansieæ, is made to receive the Rhodomeleæ, having a flattened frond and biseriate tetraspores. The tribe Dasyeæ is now confined to Heterosiphonia and Dasya. Vanvoorstia and Claudeæ are removed from Sarcomenieæ, and placed under a new tribe, Anomalophyellæ.

The Chondriopsideæ are now divided into nine sections, and three new species are added, viz., *Ch. subopposita*, from California, *Ch. succulenta* (= *Ch. sedifolia*, Harv., as regards the New Holland specimens only), and *Ch. arborescens* from the same country. The first is intermediate in character between *Ch. secundata* and *Ch. capensis*, the second is distinguished from *Ch. sedifolia* by its gelatinous consistence, it being readily destroyed by fresh water. The third, before the fruit was known, had been confused with *Ch. Harveyana*, to which it is allied, on the one hand, but to *Ch. striolata* and *Ch. fusifolia* on the other; the colour is blackish. *Ch. crassicaulis*, Harv., has been removed from the genus, being more nearly related to Chrysymenia. Three other species are regarded as only doubtful, belonging to the Chondriopsideæ, viz., *Ch. cartilaginea*, J. Ag., *Ch. nidifica*, Harv., and *Rhodomela crassicaulis*, Harv.

A new genus, Cyclospora, is created for a curious species, which in habit resembles *Merrifieldia ramentacea*, or a narrow form of *Grateloupia filicina*, but which under the microscope reminds one of Caloglossa, the numerous tripartite tetraspores extending in a nearly regular series from the apparent central rib to the margin. It has been received from Florida. In the synopsis of the tribes we find a new genus (?) Cladurus, mentioned under the Chondriopsideæ, but it does not appear in the text.

In the subsequent pages a new species of Pollexfenia, *P. nana*, from New Holland, is described. It differs from *P. pedicellata*, chiefly in its small size, and would seem to be a variety rather than a well-marked species, according to the author's description. Two new species of Amansia, *A. Hawkeri*, from Australia, and *A. Robinsoni*, from Norfolk Island, are described. The former is intermediate in form between *A. glomerata* and *A. multifida*, but more robust than either, the midrib being thickened below, and the principal branches becoming twisted and fasciculately branched. The second species is a small one, about two inches long, with linear, serrate, pinnate ramuli and ramelli. To the genus Polyphacum a new species from Australia, having entire scarcely twisted branches, is added. It is intermediate between *P. Smithiæ* and *P. proliferum*. To the genus Placophora, a doubtful species, *P. cucullata* is added. It is found parasitical on *Areschougia ligulata*. With this genus the present number is concluded. Three plates, illustrative of the structure of some of the new genera, are given, and one can only regret that it was not found possible to give in addition representations of the form and natural size of the plants of the newly-described species. Few, if any others living,

have had the experience of the veteran algologist, and one can only receive with respect his views upon classification, even if they conflict with those of algologists with younger eyes, and educated with all the advantages of modern science, and with the experience of previous observers to guide them.

E. M. Holmes.

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## FUNGI.

### Experimental Researches on the Life History of Certain Uredineæ.

By Dr. C. B. Plowright.

**Puccinia festucæ.**

*Æcidiospores* = *Æcidium periclymeni*, Schum.

*Uredospores.* Sori hypophyllous, causing conspicuous yellow spots on the upper surface of the leaves, oblong, bright yellow or orange yellow. Spores subglobose, colourless, echinulate, contents yellow, 25-30 $\mu$.

*Teleutospores.* Sori hypophyllous, linear or oblong, brownish black. Spores clavato-cylindrical, constricted, summit surmounted by a crown of from four to six obtuse, curved processes, which are sometimes bifid at their extremities. Lower cell cuneiform, attenuated below, sometimes abortive, 40-60 × 15-23 $\mu$, average 50 × 20 $\mu$, pedicels rather long, brown, persistent, 15-25 × 10-12 $\mu$.

Æcidiospores on *Lonicera periclymenum.* Uredospores and teleutospores on *Festuca ovina* and *duriuscula.*

The life history of the æcidium on honeysuckle has long remained a mystery. As early as 1881 I began to make experimental cultures with its spores, but until the summer of 1890 without any definite result. In the aggregate my experimental cultures with this species number 34. Amongst the various grasses to which the spores were applied are *Molinia cœrulœa*, *Poa compressa*, *pratensis*, *Anthoxanthum odoratum*, *Nardus stricta*, and *Luzula*, but without success. On searching the grasses near affected plants of Lonicera I upon one or two occasions found *Festuca ovina* affected with a Puccinia resembling *P. coronata*, but always in such small quantities that it seemed hardly worth an experimental trial. In 1885, however, I applied the germinating spores of *P. coronata* on *Holcus mollis* in four experiments to Lonicera leaves and once to *Rhamnus frangula.* The æcidiospores were produced on the Rhamnus, but not upon the Lonicera. In 1889 and 1890 I was fortunate enough to find a locality in which the Æcidium occurred abundantly on Lonicera and where I was enabled to collect a fair quantity of *Festuca ovina* with the Puccinia upon it. This was germinated in

1890 and gave rise to the æcidiospores. The converse culture of producing the uredospores and teleutospores on *Festuca ovina* and *duriuscula* was also successfully accomplished.

Subjoined is a tabular statement of the experiments performed* :—

| | | | 1885. |
|---|---|---|---|
| 552. | *Puccinia coronata.* on Holcus mollis. | Lonicera periclymenum... | 28 May. |
| 553. | *Puccinia coronata.* | „ „ ... | 28 May. |
| 554. | „ „ | „ „ ... | 28 May. |
| 555. | „ „ | Rhamnus frangula ... | 28 May, 6 June. |
| 556. | „ „ | Lonicera periclymenum... | 28 May. |
| | | | 1890. |
| 1132. | *Æcidium periclymeni.* | Festuca ovina ... ... | 6 June, 18 June. |
| 1134. | „ „ | „ duriuscula ... | 6 June, 20 June. |
| 1148. | „ „ | „ ovina ... ... | 10 June, 23 June. |
| 1840. | *Puccinia festuca.* | Lonicera periclymenum... | 9 June, 25 June. |

**Puccinia agrostidis.**

*Æcidiospores* = *Æcidium Aquilegiæ.* Pers.

*Uredospores.* Sori bright orange, elongate or linear, seated on yellowish spots, amphigenous, about one mm. long, spores globose or oval, colourless, echinulate, contents orange, 20-25 $\mu$.

*Teleutospores.* Sori small, covered by the epidermis, sometimes elongate, sometimes arranged in a circular manner, dark brown, spores dark brown, smooth, cylindrical or subclavate, summit thickened, truncate or rounded, attenuated below, rather markedly constricted, sessile, 40-55 × 12-20 $\mu$, average 46 × 14 $\mu$.

Æcidiospores on *Aquilegia vulgaris.*

Uredospores and teleutospores on *Agrostis alba* and *vulgaris.*

Abbot Wood, Lewes. Bowness, Windermere.

The elucidation of the life history of this species was not upon the whole so difficult as that of the preceding. It entailed, however, two journeys, one to the South of England, where I had the assistance of Mr. J. H. A. Jenner, and the other to the Lake district in company with Mr. H. T. Soppitt.

In August, 1889, Mr. Jenner was kind enough to conduct me to the habitat of the *Æcidium aquilegiæ* in Abbot Wood, near Lewes. We carefully examined the grasses near the Aquilegia plants, and succeeded in finding on *Agrostis alba* some teleutospores of a Puccinia, the sori of which were in some cases elongated, in others arranged in circles or parts of circles. A supply was secured, and, in April, 1890, applied to a plant of Aquilegia in my garden at King's Lynn. In May, 1890, Mr. H. T. Soppitt conducted me to a spot on the east shore of Lake Windermere, where the *Æcidium aquilegiæ* also occurs. We gathered not only the Æcidium, but also a small quantity of teleutospores on Agrostis.

* The first column refers to the numbers of the experiment in my note book; the second is the infecting material; the third the plant infected; the fourth the date of infection; and the fifth the date at which the first result was observable.

With this material further cultures were made by me at King's Lynn, and by Mr. Soppitt at Bradford.

Subjoined is a tabular summary of these cultures:—

| | | | 1890. |
|---|---|---|---|
| 1091. | *Puccinia agrostidis.* | Aquilegia vulgaris ... | ... 19 April, 31 May. |
| 1120. | *Æcidium aquilegia.* | Agrostis vulgaris ... | ... 27 May, 13 June. |
| | | Poa pratensis ... | ... 27 May. |
| 1125. | *Puccinia agrostidis.* | Aquilegia vulgaris | ... 31 May, 14 June. |
| 1126. | „ „ | „ „ | ... 31 May, 11 June. |
| 1127. | „ „ | „ „ | ... 2 June, 14 June. |
| 1130. | „ „ | „ „ | ... 2 June, 19 June. |

**Uromyces lineolatus,** *Desmaz.*

*Æcidiospores* = *Æcidium glaucis.*

*Uredospores.* Sori minute, linear or punctiform, scattered or confluent, long covered by the epidermis, brown, spores oval or shortly elliptical or subglobose, brown, rough, 25-30 × 18-25 μ.

*Teleutospores.* Sori minute, punctiform or linear, when dry covered by the epidermis, when moist exposed by the gaping of the edges. Spores very pale brown, smooth, fusiform, or elliptical; apex thickened, 30-45 × 15-20 μ, pedicels short, 20-25 μ.

Æcidiospores on *Glaux maritima.*

Uredospores and teleutospores on *Scirpus maritimus.*

The life history of the Æcidium on *Glaux maritima* was worked out in 1890 with the assistance of Mr. Peake, junr., of Hull, who was kind enough, in August, 1889, to conduct me to its habitat at Paul, on the banks of the Humber. The Scirpus was found in fair abundance, but the inconspicuous Uromyces is easily overlooked, as the Scirpus is frequently spotted with other fungi in a far more striking manner. The teleutospores germinated in April, 1890, and when applied to the foliage of the Glaux gave rise to the æcidiospores in 14 days. I was at first disposed to regard the Uromyces as a distinct species (*U. maritima*), but am now satisfied that it is identical with that of Desmazieres.

| | | | |
|---|---|---|---|
| 1105. | *Uromyces lineolatus.* | Glaux maritima ... | ... 29 April, 8 May. |
| 1119. | „ „ | „ „ ... | ... 13 May, 21 May. |
| 1124. | *Æcidium glaucis.* | Scirpus maritimus... | ... 29 May, 11 June. |
| 1138. | „ „ | „ „ ... | ... 7 June, 23 June. |
| 1152. | „ „ | „ „ ... | ... 13 June, 23 June. |

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## Revision of the Genus Triphragmium, *Link.*

By G. Massee.

Judging from the descriptions given in systematic works the teleutospores in Triphragmium—on which the specific characters are almost entirely based—would appear to be very constant; such, however, is not by any means the case in any described species, as shown by the accompanying figures, where the variety of forms figured were not specially sought for, but in each species show the different forms seen in a single preparation. Magnus

has noted the variability of the spores in Triphragmium,* and Patouillard† has some remarks bearing on the same subject in his description of *T. setulosum*.

Three forms of spore, belonging to the teleutospore stage, are to be met with in every species, as follows:—(i.) The generally understood Triphragmium type, a radiately three-celled spore. The basal cell is seated on a more or less elongated pedicel; each cell has a single germ-spore. This type is by far most abundant in every species (excepting *T. acaciæ*, Cke.), and in the accompanying figures is indicated by a small ×. (ii.) A two-celled spore, having the cells superposed and separated by a transverse septum, resembling the spore of a Puccinia; each cell having one lateral germ-pore; pedicel as in the first type. (iii.) A one-celled spore, with a single lateral germ-pore and basal pedicel.

Variations of the types described above are common. In (1) the three cells are normally, that is most frequently, about equal in size, but, as the figures show, this state of things is by no means constant. Sometimes one or other of the cells is much reduced in size, and when very small is not furnished with a germ-pore. Not unfrequently there are two basal cells, divided by a vertical septum, the pedicel at first sight appearing to be fixed to the septum, and thus common to the two cells, but in every example of such that I have examined the pedicel is found to be organically united to one cell only, as shown in Fig. 4 ×.

Dietel states that in most species of Triphragmium the germ-pore perforates the inner layer of the endospore only.‡

The germination of the component cells of the teleutospore (in (*T. ulmariae*) is basipetal, the pro-mycelium of the basal cell being formed last, and is as a rule not so robust as the tubes of the superior cells, and in not a few instances is not developed at all, or remains in a rudimentary condition.

Magnus§ favours the view that the uredospores in the Uredineæ have developed out of teleutospores, and the variability in the last-named type of spore in the genus Triphragmium appears to favour this view. As a rule the teleutospores are most constant in form in those species of the Uredineæ where uredospores are also present.

The accompanying figures belong to the following species, as understood in Saccardo's "Sylloge Fungorum," Vol. vii., Pt. II.

Fig. 1.—*Triphragmium isopyri*, Moug. (drawn from Moug. & Nest., Stirp. Cr., No. 892).
„ 2.—*T. ulmariæ*, Link. (drawn from Cooke's Fung. Brit. Exs., No. 23).
„ 3.—*T. filipendulæ*, Pass. (drawn from Rab., Fung. Eur., No. 2082, Com. Passer.).

* "Ber. der Deutschen Bot. Gesellsch.," 1891, p. 120 (1 pl.).
† "Journ. Bot." (Morot), 1890, p. 58, Fig. 3.
‡ "Flora," lxxiv. (1891), p. 140 (1 pl.).
§ "Ber. Deutsch. Bot. Gesell.," ix. (1891), Gen.-Versamml. Heft., pp. 85 (1 pl.).

Fig. 4.—*T. setulosum*, Pat. (drawn from specimen com. by Patouillard).
„ 5.—*T. echinatum*, Lév. (drawn from specimen from Léveille in Hb. Kew).
„ 6.—*T. Thwaitesii*, B & Br. (drawn from type specimen in Hb. Kew).
7.—*T. clavellosum*, Berk. (drawn from type in Herb. Kew).
8.—*T. acaciæ*. Cooke (drawn from type in Herb. Kew).

**Triphragmium**, *Link*.

Teleutospores brown, normally consisting of three cells, radiately arranged, the three septa meeting at a central point when seen in optical section ; lower or basal cell with a hyaline pedicel ; each cell with a single germ-pore ; epispore even or variously ornamented ; uredospores subglobose, with more than one lateral germ-pore ; spermogonia are present in some species.

*Triphragmium*, Link, Sp. Plant. Linn., Willden. ed. (1824), Pt. II., p. 84, t. vi. (1824); emended by Tulasne, Ann. Sci. Nat., Ser. 4, Vol. ii, p. 181 ; Sacc. Syll., Vol. vii., Pt. II., p. 768.

The present genus is characterized by the teleutospores consisting of three more or less triangular cells, their points meeting at the centre, when seen in optical section ; each cell has one lateral germ-pore.

*Sartwellia* appears to approach the present genus in some respects, but its typical teleutospore is two-celled, the two cells being superposed, as in Puccinia, basal cell with a long hyaline pedicel ; the upper cell has an apical and also an equitorial ring of germ-pores, the lower cell having an equitorial ring of germ-pores only. In addition to the typical form described above, teleutospores are not uncommon having the apical cell divided into two by a vertical septum, thus producing the Triphragmium type of teleutospore ; others, again, have only a single cell, as in Uromyces. Comparing the two genera, Triphragmium and Sartwellia, and speaking of the type of spore most abundant as the typical form, we observe that the general tendency of modification from the typical teleutospore in Triphragmium is towards a reduction in the number of its component cells, whereas in Sartwellia the deviation from the typical form is in the opposite direction, and to build up a teleutospore of the Triphragmium type.

The genus Sphærophragmium, founded by Magnus,* is also closely allied to Triphragmium, differing, according to the author, in the teleutospores consisting of from 4-9 cells, and forming a spherical or ellipsoidal body, and not a single superposed row of cells, as in Phragmidium. Sphærophragmium is founded on the species called *Triphragmium acaciæ*, Cooke, and an examination of Cooke's type specimen shows that, although the majority of the teleutospores have more than three cells, others are not wanting with three or even two cells only (Fig. 8), and in the great majority of instances the spore, in its primitive form, appears to follow the Diorchidium type, having two cells placed laterally and separated by a vertical septum, the two cells being broken up into a varying number of cells in different teleutospores. The spines on the

* "Ber. der Deutschen Bot. Gesellsch.," 1891, p. 121.

spores are exactly like those on the teleutospores of *Triphragmium clavellosum*, Berk., and when the spores are three-celled, are indistinguishable from those of the last-named species, and I am not certain whether Cooke was not nearer the truth in referring the species to Triphragmium, than was Magnus in making it the type of a new genus.

**Triphragmium ulmariæ**, *Link* (*in part*), (*Figs.* 2 *and* 3).

*Teleutospores.* Sori hypophyllous and, on the petioles, small, gregarious, blackish-brown, more or less pulverulent ; teleutospores subglobose or broadly and obtusely obovate, usually consisting of three cells radiately disposed, 35-55 × 24-35 μ, sometimes consisting of two superposed cells, or of one cell only ; epispore varying from being rather coarsely tuberculose to perfectly smooth ; pedicel equal to or a little longer than the spore, rather stout, hyaline, persistent.

*Primary uredospores.* Forming deep orange, powdery, extended patches on petioles, or hypophyllous, usually following the veins ; spores subglobose, elliptical, or broadly obovate, minutely verruculose, bright orange, 18-35 × 15-24 μ ; pedicel short, hyaline. Appearing in spring.

*Secondary uredospores.* Sori hypophyllous, small, scattered,


TELEUTOSPORES OF *Triphragmium*.

rounded, orange; spores globose or elliptical, minutely echinulate, 16-33 × 14-25 μ. Appearing in summer and autumn.

*Spermogonia.* Hypophyllous, minute, reddish-yellow, spermatia elliptic-oblong, 5-6 μ long, colourless.

*Triphragmium ulmariæ*, Link, Sp. Pl. Linn., ii., p. 84, t. vi.; Tulasne, Ann. Sci. Nat., Ser. iv., Vol. ii., Pl. X., Figs. 14-18; Corda, Icon. Fung. Pt. iv., Pl. VI., Fig. 73; Cooke, Hdbk., p. 492; Cooke, Rust, Smut, etc., Ed. iv., p. 202, t. iii., Fig. 48; Plowr., Brit. Ured. and Ustilag., p. 218, Pl. IV., Fig. 6; Schröt., Pilz. Schles., iii., Pt. i., p. 350; Winter, Rabh., Krypt-Flor., Vol. i., p. 225; Sacc. Syll., Vol. vii., Pt. ii., No. 2680.

*Triphragmium filipendulæ*, Passerini, Nuov. Giorn. Bot. Ital., Vol. vii., p. 255; Plow., Brit. Ured. and Ustilag., p. 219.

*Uredo ulmariæ*, Schum., Enum. Pl. Saell., Vol. ii., p. 227.

*Uredo spireæ*, Sow., Engl. Fungi, t. 398.

*Uredo effusa*, Berk., Engl. Flora, Vol. v., p. 381; Grev., Scot. Cr. Fl., t. 19.

*Uredo (Uromyces) filipendulæ*, Wint., Kr. Fl., p. 226.

*Puccinia ulmariæ*, Hedw., in D. C., Flor. Fr., p. 56; Berk., Engl. Flor., Vol. v., p. 368; Grev., Flor. Ed., p. 433; Johnst., Flor. Berwick, Vol. ii., p. 194.

*Puccinia spiraeæ*, Purton, Midl. Flor., Vol. iii., p. 304.

*Uromyces ulmariæ*, Lév., Cooke, Rust, Smut, etc., Ed. iv., p. 212, t. vii., Figs. 147, 148.

*Coleosporium spireæ*, Karsten, Enum. Fung. Lap. Or., p. 222.

*Exsicc.* Cke., Fung. Brit., 23 and 75; Cooke, Fung. Brit., Ed. ii., 146 and 212; Cooke, Leaf Fungi, 4 and 25; Berk., Brit. Fung., 343; Vize, Fung. Brit., 6 and 136; Vize, Micro. Fung. Brit., 424 and 546; Ayres, Myc. Brit., 93; Karst., Fung. Fenn., 294 and 682; Westendorp, Herb., Crypt. Belg., 1167 and 1183; Thum., Fung. Austr., 362; Sydow, Myc. March., 235; Kunze, Fung. Sel., 542; Sydow, Uredin., 223; Moug. and Nestl., Stirp. Crypt., 891; Desmaz., Cr. Fr., Ser. i., 771 and 1488; Rab., Fung. Eur., 181, 924, 2081, 2082; Rab., Herb. Myc., Ed. ii., 336; Fckl., Fung. Rhen., 317; Roumeg., Fung. Gall., 1508, 3125, 3418, 3854, 2542; Thum., Myc. Univ., 543 and 2236.

*Hab.* On living leaves, petioles, and stems of *Spiraea ulmaria* and *S. filipendula.*

*Distrib.* Britain, France, Germany, Italy, Austria, Finland, Asiatic Siberia.

*Triphragmium filipendulæ*, Pass., was considered to differ from *T. ulmariæ* in the smooth teleutospores and in growing on a different host. The first character is, however, by no means constant; a specimen sent by Passerini to Dr. Cooke has many of the spores distinctly warted, others smooth; in Rabenh., Fung. Eur., No. 2082, communicated by Passerini, many of the spores are as coarsely warted as in *T. ulmariæ*; the same remark applies to Thumen, Myc. Univ., No. 543, also communicated by Passerini. On the other hand, *T. ulmariæ*, Fuckel, Fung. Rhen., No. 317, on

*Spiraea ulmaria*, has spores in the same pustule, varying from the typical warted form to others perfectly smooth. Tulasne states, in a footnote, that he found, near Paris, a specimen of *Triphragmium ulmariæ*, Lk., on the leaves of *Spiraea filipendula*, accompanied by the same uredo and spermogonia as when growing on *S. ulmaria*. This species was in all probability *T. filipendulæ*, Pass. The habit and appearance of the two so-called species is identical, and the differences in form and size of the spores from the same pustule of either species respectively is quite as great as the differences between the two given in systematic works. For the reasons given above the two are considered as identical.

**Triphragmium isopyri**, *Moug.* (Fig. 1).

*Teleutospore.* Sori extending up to 4 m.m. diam., irregular, more or less bullate, black and somewhat powdery after the epidermis is ruptured, occurring on both sides of the leaf, also on the petiole; spores most frequent consisting of three cells, the basal cell seated on an elongated hyaline pedicel that is attenuated downwards, 32-47 $\mu$ diam.; spores formed of 2-3 superposed cells, separated by transverse septa, are not uncommon; epispore clear yellowish-brown, ornamented with sparsely scattered, rather large, obtuse warts, usually fewest in number, or almost entirely absent from the basal cell.

*Triphragmium isopyri*, Mougeot, in Moug. & Nestl. Stirp. Crypt., No. 892; Sacc. Mich., iv., p. 363; Sacc. Syll., vii., Part II., No. 2684.

*Exsicc.* Moug. & Nest., Stirp. Crypt., No. 892; Roum., Fung. Gal. Gall., No. 319; Desm., Crypt. Fr., Ser. i., No. 1487.

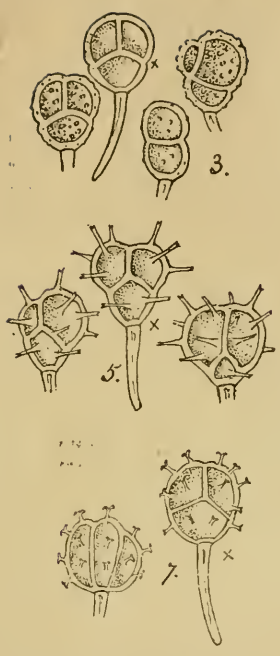
*Hab.* On living leaves and petioles of *Isopyrum thalictroides*.

*Distrib.* France; Italy.

The teleutospores of the present species bear a close resemblance to those of *T. ulmariæ*, the warts on the epispore being usually more scattered than is general in the last-named species. *I. isopyri* is, however, quite distinct in habit, the sori being often large and effused or elongated on the petiole, black and powdery, and in general appearance resembling *Erocystis anemones*.

**Triphragmium setulosum**, *Pat.* (Fig. 1).

*Teleutospore.* Sori orbiculate, brown, about 1 m.m. diam., compact, scattered or in groups of 5-10, seated on a yellowish spot, occurring on both sides of the leaf; thesori are surrounded by cylindrical, rigid, obtuse paraphyses of a yellowish brown colour, paler towards the apex, 35-80 × 10 $\mu$; spores very variable in structure, most frequently consisting of three cells, two inferior, and separated by a vertical septum, one superior; epispore olive brown, smooth, excepting a small area round the germ-pore of each cell, which is minutely echinulate; 25-40 × 20-32 $\mu$; pedicel 10-14 × 6 $\mu$, hyaline; not unfrequently the two basal cells alone are present, sometimes one cell as in Uromyces.




TELEUTOSPORES OF *Triphragmium*.

*Uredospore.* The uredospores are developed from the same sori as the teleutospores, and precede them; subglobose, brownish, minutely echinulate, 17-20 × 13-16 $\mu$.

*Triphragmium setulosum*, Pat., Journ. Bot. (Morot), Vol. iv., p. 58 (Fig. 3); Sacc. Syll. Suppl., Vol. ix., No. 1313.

*Hab.* On the leaves of an unknown shrub.

*Distrib.* Fu-Phap, Tonkin.

A very distinct and remarkable species, a specimen of which was kindly communicated by the author. The teleutospores having three cells are just the reverse of those met with in other species, inasmuch as there are two basal cells divided by a vertical septum and a single apical cell; the pedicel at first sight appears to be a downward continuation of the median septum, but when examined carefully it is found to be organically attached to one of the basal cells only, close to the septum, as in Fig. 4, also the two spores to the right also belonging to Fig. 4. When the two basal cells are alone present, the structure is identical with that most usual in the genus *Diorchidium*, a spore composed of two cells placed laterally and divided by a vertical septum. In the last named genus I find that the pedicel has frequently the oblique mode of insertion, and is not a continuation of the septum, which, indeed, it could never be if the idea previously mentioned respecting the structure of the teleutospore be correct.

**Triphragmium echinatum,** *Lév.* (Fig. 5).

*Teleutospore.* Sori more or less elongated, often confluent and broadly diffused, black, pulverulent, on the leaves, petioles, and the stems; spores radiately three-celled, obtusely triangular or almost spherical, 25-35 $\mu$ diameter; epispore dark brown, ornamented with 8-13 long, slender, brown, cylindrical or slightly tapering spines, 8-11 × 1·5-2 $\mu$; apex obtuse or usually furnished with 2-3 very minute, more or less recurved spicules; pedicel 35-40 × 6-7 $\mu$, hyaline, deciduous.

*Triphragmium echinatum.* Lév., Ann. Sci. Nat., Ser. iii., Vol. ix., p. 247; Krypt.-Fl. Schles., p. Vol. iii., Pt. I., p. 351; Winter, Rab. Krypt-Fl., Vol. i., Pt. I., p. 225; Sacc. Syll., Vol. vii., Pt. II., No. 3683.

*Exsicc.* Rab., Herb. Myc. Ed. 2, No. 787; Rab., Fung. Eur., No. 2062; Thumen, Fung. Austr., No. 849; Jack, Leiner, etc., No. 943; Ellis, N. Amer. Fung., N. 1064.

*Hab.* On living leaves, petioles and stems of *Meum athamanticum* and *Œnanthe californica.*

*Distrib.* France; Germany; Austria; United States.

A very distinct species, characterized by the long, scattered spines on the teleutospores. So far as my observations go the spores are always three-celled, but the cells are often very unequal in size, the basal cell more especially being frequently much smaller than the remainder. Uredospores are unknown in this species.

**Triphragmium clavellosum**, *Berk.* (Figs 6 and 7).

*Teleutospore.* Sori small, usually crowded in roundish patches, black, most frequently, but not always, confined to the under surface of the leaf; spores 3-celled, more or less spherical, sometimes slightly obcordate, cells either radiate, one basal, or the three cells laterally arranged, and separated by two more or less vertical septa, 26-38 $\mu$ diameter; epispore brown, ornamented with scattered, cylindrical, pale spines, 5-7 $\mu$ long, furnished at the apex with 2-3 minute, more or less recurved, spines; pedicel 40-50 × 6-7 $\mu$, hyaline.

*Triphragmium clavellosum*, Berk., Gard. Chron., 1857; N. Amer. Fungi, No. 558, in Grev., Vol. viii., p. 55; Ceylon Fungi, No. 823, in Journ. Linn. Soc., Vol. xlv., p. 92; Sacc. Syll., Vol. vii., Pt. ii., No. 2685.

*Triphragmium Thwaitesii. B. & Br., Ceylon Fungi,* No. 822, in *Journ Linn. Soc.*, Vol. xlv., p. 92; *Sacc. Syll.*, Vol. vii., Part ii., No. 2686.

*Exsicc.* Rab.-Wint. Fungi Eur., No. 2918.

*Hab.* On living leaves of *Aralia nudicaulis*, *Hedera stellata*, *H. vahlii*, *Paratropha*, and on some undefined species belonging to the Amygdaleaceæ.

*Distrib.* United States; Ceylon.

*Triphragmium Thwaitesii*, B. & Br., is identical with *T. clavellosum*, Berk., and I am not at all certain as to whether the latter is specifically distinct from *T. echinatum*, Lev.; the extreme forms appear different, but there are connecting links, as the specimens in Rab.-Wint. Fung. Eur., No. 2918, communicated by Professor Farlow, and collected in New Hampshire, United States; these are parasitic on *Aralia nudicaulis*, and the general habit is exactly that of *T. clavellosum*, B., but the spores closely resemble those of *T. echinatum*, being brown, and ornamented with scattered, elongated brown spines, very slightly or not all divided at the apex, whereas the most usual form of spore in *T. clavellosum* the spines are paler than the epispore, 5-7 $\mu$ long, and with 2-3 minute, recurved spinules at the apex, a point of no great importance in all probability, as I have already shown that the epispore ornamenta-

tion is far from being constant in other species. However, for the present *T. clavellosum* may stand as a species.

*Species excluded.*

**Triphragmium acaciæ**, *Cke.* (Fig. 8) = *Sphærophragmium acaciæ*, Mag.

**Triphragmium deglubens**, *Berk. & Curt.* = *Phragmidium*(?) *deglubens*, De-Toni.

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## Uredo vitis, Thüm.

Professor Lagerheim has recently published a new uredine,* *Uredo Vialæ*, parasitic on living leaves of the grape vine, collected near Kingston, Jamaica. In a note accompanying the description it is stated that previous to this discovery no member of the Uredineæ was known to be parasitic on the vine, the species previously published by Thümen as *Uredo vitis* not belonging to the Uredineæ, and, in matter of fact, not being a fungus at all.

The *Uredo vitis*, Thüm., was collected by Ravenel at Aiken, South Carolina, and specimens of this species sent by Ravenel to Dr. Cooke, with a label bearing the following in Ravenel's handwriting: "*Uredo vitis*, Thümen; on *Vitis;* Aiken, S.C.; H. W. R.," also a specimen from Thümen, clearly proves, notwithstanding Lagerheim's statement to the contrary, that *Uredo vialæ*, Lagerh., is absolutely identical with *Uredo vitis*, Thüm.†

*Uredo vitis* was collected in abundance in Jamaica during the years 1879-80 by Mr. D. Morris, who forwarded specimens to Kew; these were examined by the Rev. M. J. Berkeley, who, not being at that time aware of Thümen's publication, gave the MS. name of *Uredo viticola*, which was not, however, published, as in the meantime Berkeley had become acquainted with Thümen's work, and the species was referred to *Uredo vitis*, Thüm. A brief description of the Uredo without a name is given by Berkeley in the report of the Jamaica Botanical Journal for 1880.

Mr. Hart, superintendent of the Royal Botanical Gardens, Trinidad, states that the Uredo exists also in Trinidad and St. Vincent.

It is somewhat remarkable that *Uredo vitis* is not known in the United States, specimens sent to the United States Department of Agriculture being named *Uredo vialæ*, Lagerh., and stated to be unknown in that country, whereas all the evidence points to the probability of the Uredo having been introduced into the West Indies from the United States, and Ravenel's specimens mentioned above are American.

There is also a good specimen of *U. vitis* in the Ravenel

* "Compt. Rend.," 1890, p. 728.
† "Die Pilze des Weinstockes," p. 182.

Herbarium, recently purchased by the British Museum, collected at Aiken, Rav., No. 2119.

The following description of *Uredo vitis*, Thüm., is drawn up from Ravenel's specimen from Aiken, S. Carolina, and now in the Kew Museum :—

Sori hypophyllous, usually minute, and more or less crowded, bright yellow, resembling very minute accidia when seen under a pocket lens, due to the elevated marginal border of paraphyses; spores pyriform or broadly elliptical, 18-30 × 15-18 $\mu$; epispore thin, minutely verruculose, colourless, contents orange-yellow; paraphyses colourless, cylindrical, slightly curved, 30-55 × 7-9 $\mu$.

Sori rarely larger and solitary; upper surface of leaf marked with spots; the spores are sometimes attenuated into a short pedicel-like base.

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## NEW OR CRITICAL BRITISH FUNGI.

By G. Massee.

**Stigmina**, *Sacc.*

Conidia ovoid or oblong, 2-many-septate, coloured, terminal on short conidiophores, aggregated in small patches; growing on leaves.

*Stigmina*, *Sacc. Mich.* II, *p.* 22; *Sacc. Syll.* IV., *p.* 294.

Differs from *Clasterosporium* in the conidia being crowded into compact patches. *Fusariella* is distinguished by the fusoid, falcate conidia.

**Stigmina Visianica**, *Sacc.*

Patches minute, scattered or gregarious, erumpent, becoming superficial, flattened, blackish-olive, slightly velvety, hypophyllous; conidia densely packed, but individually distinct at the base, springing from a dark, cellular basal stratum, elliptic-oblong, rather obtuse at both ends, 18-35 × 7-10 $\mu$, 2-4, usually 3-septate, rarely with 1 or more vertical septa, greenish-olive; conidiophores very short, hyaline.

*Stigmina Visianica*, *Sacc.*, *Fung. Ital. t.* 930; *Sacc. Syll.* IV., *No.* 1871.

On fallen leaves of *Platanus orientalis*. (Kew). Resembles *Cladosporium epiphyllum* in habit.

**Ustilago Vaillantii**, *Tul.*

Sori olive-brown, at length black and powdery, developed in the anthers and ovary; spores somewhat irregular in form and size, globosely angular, oblong, or elliptical, 8-18 × 6-13 $\mu$, epispore yellowish-brown, densely covered with minute warts, rarely almost or quite smooth; promycelium pedicellate, fusoid, for the most part 1-septate; sporidiola pedicellate, elliptic-fusoid.

*Ustilago Vaillantii*, *Tul.*, *Mem. sur les Ustilag.*, *Ann. Sci. Nat.* 1847, *p.* 90, *t.* 3, *f.* 15-19.

On *Scilla bifolia*, Newry; *Chionodoxa*, Kew.

**Sarcoscypha tenuispora,** *Cke. & Mass.*

Cups stipitate, at first clavate, often distorted and confluent, reaching 1 inch in height and 1 inch diameter, fleshy, soft, externally white, clad on the stem especially with short white woolly hairs, which diminish to the almost naked margin. Stem thick, variable, scarcely so long as the cup, into which it is gradually expanded. Disc plane, seldom concave, whitish, becoming dusky, scarcely marginate; substance of the cup thick and fleshy. Asci cylindrical, spores very narrowly elliptical, rounded at the ends, binucleate, 16-20 × 4-5 $\mu$, paraphyses slender, scarcely thickened above, externally granular.

On sticks and dead leaves. Scarboro' (G. M.). Halifax (Crossland).

Remarkable for the scarcely depressed disc, and especially for the very narrow spores, which are comparable to those of no other large *Peziza*.

**Trichopeziza carinata,** *Cke. & Mass.*

Sessile, $\frac{1}{4}$ m.m. broad, gregarious, snow-white, at first globose with a narrow mouth, at length more expanded, externally deeply and longitudinally channelled, so as to present from 5 to 7 distinct acute ridges or keels, clad with short white tomentose down, without septa, asci sessile, clavate, spores biseriate, subfusiform, nucleate, 12-16 × 3 $\mu$.

On fern stems. Halifax (Crossland).

Allied to *Trichopeziza hexagona*, Fckl., but with much larger sporidia.

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## BIBLIOGRAPHY.

*Rust or Mildew on Wheat Plants*, is the title of a small pamphlet issued by the Board of Agriculture, and contains a considerable amount of information on the subject. The points of greatest interest are probably the following :—

*Puccinia rubigo vera* is reproduced year after year in frightful quantities by the uredospores only.

*Puccinia graminis* is far more destructive to corn crops in countries where the Berberidaceæ are not indigenous than in Europe; hence this species, like *P. rubigo vera*, must either be able to reproduce itself year after year from the uredospores only, or the æcidiospore condition is developed on some plant not belonging to the *Berberidaceæ*. The first alternative is most probable, but not yet definitely proved.

Spraying with a fungicide has, on the whole, proved beneficial.

Rust resisting varieties of wheat are characterized by a thick cuticle, tough leaves, and copious bloom on the stem of the growing plant.

*Polyporus (Ovini) Mylittæ*, Cke. & Mass. (Grevillea, Vol. xxi., p. 37, Dec., 1892).

Professor Saccardo, presumably having overlooked the description of the highly interesting fungus mentioned above, has described the same as *Polyporus Mylittæ*, Sacc., in Hedwigia, March-April, 1893, p. 56.

*Sur la classification des Basidiomycetes.* Ph. Van Tieghem (Journ. Bot., Morot, Vol. vii., 1893, p. 77).

According to the author, the immense class of fungi are divided into four orders:—

1. *Oomycetes.* Thallus continuous, that is to say, not broken up into cells by transverse septa, and produce oospores, isogamous or heterogamous.

2. *Myxomycetes.* Thallus consisting of free, mobile cells, that are destitute of a cellulose membrane.

3. *Ascomycètes.* Thallus multicellular, cells furnished with a cellulose membrane, immobile; spores formed, usually in definite number, within special mother-cells called asci.

4. *Basidiomycetes.* Thallus multicellular, cells immobile, furnished with a cellular membrane; spores produced, usually in definite number, upon special mother-cells called basidia.

Considering the fact that the Myxomycetes have of late years been considered as distinct from the fungi, but not therefore necessarily outside the limits of the vegetable kingdom, it appears desirable that Van Tieghem should give us a definition of the class *Fungi*, as understood by him, thus furnishing a key-stone to his ordinal characters.

The character founded on the absence of septa in the thallus of the *Oomycetes* is incorrect, although often given in books, septa being normally and habitually present in the vegetative portions of numerous species; this feature is clearly shown in the four beautiful plates illustrating Van Tieghem's researches on the *Mucorini*.*

The Basidiomycetes are divided into two primary groups; *Acrosporeæ*, spores apical on the basidium; *Pleurosporeæ*, spores produced laterally on the basidium. These primary sections are in turn each broken up into two, depending on the basidia being one celled, or septate.

The teleutospore in the Uredineæ is described as a *probasidium*, the promycelium to which it gives origin on germination, the *basidium*, and the sporidia or promycelium spores are considered as the true *spores*.

*British Fungus-Flora.* G. Massee.—The second volume of this work, dealing with the Agaricineæ, is now ready. The third volume, containing the remainder of the Basidiomycetes and the whole of the Hyphomycetes, will be ready in September.

* "Ann. Sci. Nat.," Ser. vi., Vol. i. (1875), p. 5, pl. 1-4.

*Guide to Sowerby's Models of British Fungi in the British Museum (Natural History)*, by Worthington G. Smith.

This "guide" is not a mere catalogue of names, but serves as an introductory text book; there is a brief introduction to the study of fungi, the necessary technical terms are explained and made quite clear by the aid of diagrammatic sections. In what may be termed the systematic portion, all the species illustrated by models exhibited in the Botanical Gallery are described, and their properties, edible, poisonous, etc., are also noted. The numerous figures interspersed in the text will be found of great value to those commencing the study. The slip on p. 6 respecting the origin of the spores in the *Lycoperdaceæ* will require attention in a second edition.

*Kulturversuche mit heteröcischen Uredineen.* (Culture experiments with Heterocismal Uredines.) H. Klebahn, Zeitschr. für Pflanzenkr., II. Bd., 5 u., 6 Heft, p. 1 (1 ph.).

The cultures and results recorded in the present paper are of value to those specially interested in the heterocismal Uredines, although to the outsider there always appears the great necessity for a considerable amount of faith in addition to the evidence forthcoming.

The fact that heterœcism exists very few persons deny at the present day, but at the same time demonstrable evidence is by no means easy; for instance, has either friend or foe of the theory ever corroborated De Bary's observation relating to the piercing of the epidermis of the barberry leaf by the germinating promycelial spores of *Puccinia graminis*.

Among other things are two new species of *Peridermium*, *P. Plowrightii* (Kleb.),=*Coleosporium tussilaginis* (Pers.), and *P. Stahlii* (Kleb.)=*Coleosporium euphrasiæ* (Schum.).

The relationship between a *Puccinia* on *Phalaris* and *Æcidium convallariæ*, first pointed out by Soppitt, has been corroborated; the *Puccinia* is probably *P. digraphidis*, Soppitt, although the teleutospores only measure 32-41 × 15-18 μ.

*Fungi Æthiopico-Arabici.* P. Hennings, legit. G. Schweinfurth, Bull. de l'Herb., (Boissier), I., p. 97 (1893), 2 pl.—Many new species are described and figured. *Guepinia fissa* (Berk.) is a very variable species, and shows a sequence far wider in habit, size, and form than the new var. *Abyssinica* (P. Henn.), as described and figured.

*Sphœrophragmium Dalbergiæ.*—Dr. Dietel has described under the above name a new Sphærophragium, parasitic on *Dalbergia armata*, from Inanda, Natal (Hedw., 1893, Heft 1, p. 30).

*On the Myxobacteriaceæ, a New Order of Schizomycetes.* Roland Thaxter (Bot. Gaz., Vol. xvii., p. 389, 4 pl.).

Dr. Thaxter has described what appears to be a very remarkable new order of Schizomycetes, some of the members having pre-

viously been described as fungi, as *Chondromyces* (B. & C.), etc. A remarkable feature of the order is the close superficial resemblance of the organisms to those of the Myxomycetes.

The order includes nine species and three genera. *Polycephalum aurantiacum* (Kalchbr. and Cooke), and *Stilbum rhytidospora* (B. & Br.), are given as synonyms—with a query—under *Chondromyces aurantiacus* (B. & C.), Thax. This idea, an examination of the types of these species proves to be correct.

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## MUSCINEÆ.

*Two New American Mosses.* G. N. Best (Bull. Torr. Bot. Club, Vol. xx., p. 116, 1892.)—*Buxbaumia Piperi* (Best). On rotten wood, or on ground covered with woody *débris*, in mountainous regions. This species is said to be "intermediate between *B. aphylla* and *B. indusiata*. The shorter and the more curved pedicel, the more erect capsule, not markedly depressed nor strongly margined, peristome of a single well-developed layer, spores larger, readily separate it from the former. The more symmetrical capsule, peristome of four layers, the outer successively shorter, of *B. indusiata* mark it as distinct from the latter. In *B. aphylla* the operculum is usually thimble-shaped, the peristome rudimentary." The second new species, *Ditrichum ambiguum* (Best), is said to be most closely allied to *D. tenuifolium* (Schrad.), Lindb.

*Two New Species of Mosses from Idaho.* J. B. Leiberg (Bull. Torrey Bot. Club, Vol. xx., p. 112, 1893, 2 pl.).—The two new North American species are *Ditrichum montanum* and *Grimmia pachyphylla.* Concerning the last, the author says, "A fine form of the Rhabdogrimmia section, most nearly related to *Grimmia decipiens* (Schultz.), Lind., from which species it differs mainly in its dioicous inflorescence, its open leaf base, smoother hairy point, its broader basilar, its shorter medial, and its quadrate-apical areolation, its pluri-stratose nerve, the longer beak of its lid, its narrow and persistent annulus, and the peristome incurved when dry."

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## ERRATA.

P. 52, 17 lines from bottom, for *Porf.* read *Prof.*
„ 57, 18 „ „ „ for *tenaculoids* read *tentaculoids.*
„ 61, 7 lines from top, for *longuis* read *longius.*

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